



## **B.Tech. - INFORMATION TECHNOLOGY**

### **REGULATIONS - 2023**

### **CHOICE BASED CREDIT SYSTEM (CBCS)**

### **CURRICULUM AND SYLLABUS**

*[Signature]*  
Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul - 624401

**I - Department Vision**

- To cultivate a generation of globally competitive IT professionals who are equipped with the knowledge, skills, and adaptability to flourish amidst technological advancements.

**II - Department Mission**

- To achieve academic excellence in Information Technology by fostering a dynamic learning environment that seamlessly integrates innovative computing methodologies into the teaching and learning process
- To create a nurturing environment for students to develop professionalism, ethical awareness, and social responsibility while adapting to evolving programming paradigms.
- To foster industry-institute collaboration that leverages emerging technologies and programming expertise, aligning them with global standards and industry expectations.

**III - Program Name: B.Tech. - INFORMATION TECHNOLOGY****IV - Program Educational Objectives**

Graduates will be able to

**PEO I** - Demonstrate technical competence with analytical and critical thinking to understand and meet the diversified requirements of industry, academia, and research.

**PEO II** - Exhibit technical leadership, team skills, and entrepreneurship skills to provide business solutions to real-world problems.

**PEO III** - Work in multi-disciplinary industries with social and environmental responsibility, work ethics, and adaptability to address complex engineering and social problems.

**PEO IV** - Pursue lifelong learning, use cutting-edge technologies, and involve in applied research to design optimal solutions.

**V - Program Outcomes**

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

  
Chairperson-Board of Studies,

Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401



4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

#### VI - Program Specific Outcomes

To ensure graduates,

1. Have proficiency in programming skills to design, develop and apply appropriate techniques, to solve complex engineering problems.
2. Have the knowledge to build, automate and manage business solutions using cutting-edge technologies.
3. Have excitement about research in applied computer technologies.



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## VI - Mapping of PEOs, POs, and PSO

| POs<br>PEOs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| PEO I       | ✓    | ✓    | ✓    | ✓    | -    | ✓    | ✓    | -    | ✓    | -     | ✓     | ✓     | ✓     | ✓     | ✓     |
| PEO II      | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | -    | ✓    | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     |
| PEO III     | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     |
| PEO IV      | ✓    | ✓    | ✓    | ✓    | ✓    | -    | ✓    | -    | -    | -     | ✓     | ✓     | ✓     | ✓     | ✓     |

## VIII - Program Scope

The Program for B. Tech (IT) is vast and offers abundant career opportunities.

- Graduates can pursue careers in Software Development, Data Analysis, Cyber Security, Artificial Intelligence, Machine Learning, Web Development, Mobile Application Development, Computer Networking and IT Consulting.
- They can work in various industries such as technology companies, finance, health care, e-commerce, government organizations and startups.
- The Program equips students with the necessary technical skills and knowledge to design and develop computer systems, solve complex problems and contribute to technological advancements in the digital age.

## IX - Program Specific Criteria

**Core Technical Knowledge:** The curriculum should cover fundamental areas of IT including algorithms, data structures, programming languages, computer organization and architecture, operating systems, databases, software engineering principles, computer networks and theory of computation.

**Mathematics and Science Foundation:** The program should provide a strong foundation in mathematics, including calculus, discrete mathematics and linear algebra, as well as relevant scientific principles that underpin computer science, information technology, such as logic and probability theory.

**Breadth of Information Technology:** The curriculum should offer a broad range of elective courses that allow students to explore various areas of computer science and information technology such as artificial intelligence, machine learning, data science, computer graphics, human-computer interaction, cyber security and software development.

**Laboratory and Project Experience:** The Program should provide hands-on-laboratory experiences to reinforce theoretical concepts and develop practical skills. Project based courses or capstone projects that require students to apply their knowledge and skills to solve real- world problems are also essential.

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**Professional skills and ethics:** IT Program should emphasize the development of professional skills, including communication, teamwork, problem-solving, critical thinking and ethical considerations. Students should understand the ethical and social implications of computing and prepared to adhere to professional standards.

**Continuous Improvement and Assessment:** IT Program should have mechanisms in place for continuous improvement and assessment of student learning outcomes. This involves regular evolution of the curriculum, feedback from industry professionals, alumni and students, and incorporation of emerging trends and technologies.



**Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401**

## X Curriculum from Semester - I to Semester - VIII

## SEMESTER I

| S. NO.            | COURSE CODE | COURSE TITLE                      | CATEGORY | PERIODS PER WEEK |          |          | TOTAL CONTACT PERIODS | CREDITS   |
|-------------------|-------------|-----------------------------------|----------|------------------|----------|----------|-----------------------|-----------|
|                   |             |                                   |          | L                | T        | P        |                       |           |
| 1.                | 23IP100     | Induction Programme               | -        | -                | -        | -        | -                     | 0         |
| <b>THEORY</b>     |             |                                   |          |                  |          |          |                       |           |
| 2.                | 23HS101     | Professional English – I          | HSMC     | 3                | 0        | 0        | 3                     | 3         |
| 3.                | 23MA101     | Matrices and Calculus             | BSC      | 3                | 1        | 0        | 4                     | 4         |
| 4.                | 23PH101     | Engineering Physics               | BSC      | 3                | 0        | 0        | 3                     | 3         |
| 5.                | 23CY101     | Engineering Chemistry             | BSC      | 3                | 0        | 0        | 3                     | 3         |
| 6.                | 23GE101     | Problem Solving and C Programming | ESC      | 3                | 0        | 2        | 5                     | 4         |
| 7.                | 23GE103     | தமிழர் மரபு / Heritage of Tamils  | HSMC     | 1                | 0        | 0        | 1                     | 1         |
| <b>PRACTICALS</b> |             |                                   |          |                  |          |          |                       |           |
| 8.                | 23BS111     | Physics and Chemistry Laboratory  | BSC      | 0                | 0        | 4        | 4                     | 2         |
| 9.                | 23GE112     | English Laboratory – I            | EEC      | 0                | 0        | 2        | 2                     | 1         |
| <b>TOTAL</b>      |             |                                   |          | <b>16</b>        | <b>1</b> | <b>8</b> | <b>25</b>             | <b>21</b> |

## SEMESTER II

| S. NO.     | COURSE CODE | COURSE TITLE                                     | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS        |
|------------|-------------|--------------------------------------------------|----------|------------------|---|---|-----------------------|----------------|
|            |             |                                                  |          | L                | T | P |                       |                |
| THEORY     |             |                                                  |          |                  |   |   |                       |                |
| 1          | 23HS201     | Professional English – II                        | HSMC     | 2                | 0 | 0 | 2                     | 2              |
| 2          | 23MA901     | Probability and Statistics                       | BSC      | 3                | 1 | 0 | 4                     | 4              |
| 3          | 23PH203     | Physics for Information Science                  | BSC      | 3                | 0 | 0 | 3                     | 3              |
| 4          | 23BE201     | Basic Electrical and Electronics Engineering     | ESC      | 3                | 0 | 0 | 3                     | 3              |
| 5          | 23GE901     | Environmental Sciences and Sustainability        | BSC      | 2                | 0 | 0 | 2                     | 2              |
| 6          | 23CS201     | Python Programming                               | PCC      | 3                | 0 | 0 | 3                     | 3              |
| 7          | 23GE201     | தமிழரும் தொழில்நுட்பமும் / Tamils and Technology | HSMC     | 1                | 0 | 0 | 1                     | 1              |
| 8          |             | NCC Credit Course Level 1 <sup>#</sup>           | -        | 2                | 0 | 0 | 2                     | 2 <sup>#</sup> |
| PRACTICALS |             |                                                  |          |                  |   |   |                       |                |
| 9          | 23GE211     | Engineering Practices Laboratory                 | ESC      | 0                | 0 | 3 | 3                     | 1.5            |
| 10         | 23CS211     | Python Programming Laboratory                    | PCC      | 0                | 0 | 3 | 3                     | 1.5            |
| 11         | 23GE212     | English Laboratory – II                          | EEC      | 0                | 0 | 2 | 2                     | 1              |
| TOTAL      |             |                                                  |          | 17               | 1 | 8 | 26                    | 22             |

<sup>#</sup> NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

## SEMESTER III

| S. NO.     | COURSE CODE | COURSE TITLE                                      | CATEGORY | PERIODS PER WEEK |   |    | TOTAL CONTACT PERIODS | CREDITS         |
|------------|-------------|---------------------------------------------------|----------|------------------|---|----|-----------------------|-----------------|
|            |             |                                                   |          | L                | T | P  |                       |                 |
| THEORY     |             |                                                   |          |                  |   |    |                       |                 |
| 1          | 23MA302     | Discrete Mathematics                              | BSC      | 3                | 1 | 0  | 4                     | 4               |
| 2          | 23CS901     | Digital Principles and Computer Organization      | ESC      | 3                | 0 | 2  | 5                     | 4               |
| 3          | 23IT301     | Data Structures and Algorithms using Python       | PCC      | 3                | 0 | 2  | 5                     | 4               |
| 4          | 23CS302     | Foundations of Data Science                       | PCC      | 3                | 0 | 0  | 3                     | 3               |
| 5          | 23CS303     | Object Oriented Programming using Java            | PCC      | 3                | 0 | 0  | 3                     | 3               |
| PRACTICALS |             |                                                   |          |                  |   |    |                       |                 |
| 6          | 23CS311     | Data Science Laboratory                           | PCC      | 0                | 0 | 3  | 3                     | 1.5             |
| 7          | 23CS312     | Object Oriented Programming using Java Laboratory | PCC      | 0                | 0 | 3  | 3                     | 1.5             |
| 8          |             | Value Added Course - I <sup>\$</sup>              | EEC      | 0                | 0 | 2  | 2                     | 1 <sup>\$</sup> |
| TOTAL      |             |                                                   |          | 15               | 1 | 10 | 26                    | 21              |

## SEMESTER IV

| S. NO.     | COURSE CODE | COURSE TITLE                                       | CATEGORY | PERIODS PER WEEK |   |    | TOTAL CONTACT PERIODS | CREDITS        |
|------------|-------------|----------------------------------------------------|----------|------------------|---|----|-----------------------|----------------|
|            |             |                                                    |          | L                | T | P  |                       |                |
| THEORY     |             |                                                    |          |                  |   |    |                       |                |
| 1          | 23CS401     | Artificial Intelligence and Machine Learning       | PCC      | 3                | 0 | 2  | 5                     | 4              |
| 2          | 23CS402     | Database Management Systems                        | PCC      | 3                | 0 | 0  | 3                     | 3              |
| 3          | 23IT401     | Object Oriented Software Modelling and Development | PCC      | 3                | 0 | 2  | 5                     | 4              |
| 4          | 23CS404     | Operating Systems                                  | PCC      | 3                | 0 | 0  | 3                     | 3              |
| 5          | 23CS405     | Theory of Computation                              | PCC      | 3                | 0 | 0  | 3                     | 3              |
| 6          | 23EC406     | Analog and Digital Communication                   | PCC      | 3                | 0 | 0  | 3                     | 3              |
| 7          |             | NCC Credit Course Level 2 <sup>#</sup>             |          | 3                | 0 | 0  | 3                     | 3 <sup>#</sup> |
| PRACTICALS |             |                                                    |          |                  |   |    |                       |                |
| 8          | 23CS411     | Database Management Systems Laboratory             | PCC      | 0                | 0 | 3  | 3                     | 1.5            |
| 9          | 23CS412     | Operating Systems Laboratory                       | PCC      | 0                | 0 | 3  | 3                     | 1.5            |
| 10         |             | Value Added Course – II <sup>§</sup>               | EEC      | 0                | 0 | 2  | 2                     | 1 <sup>§</sup> |
| TOTAL      |             |                                                    |          | 18               | 0 | 10 | 28                    | 23             |

<sup>\$</sup> Value Added Courses – I and II are offered for all the students. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

<sup>#</sup> NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.



## SEMESTER V

| S. NO.    | COURSE CODE | COURSE TITLE                      | CATEGORY | PERIODS PER WEEK |   |    | TOTAL CONTACT PERIODS | CREDITS |
|-----------|-------------|-----------------------------------|----------|------------------|---|----|-----------------------|---------|
|           |             |                                   |          | L                | T | P  |                       |         |
| THEORY    |             |                                   |          |                  |   |    |                       |         |
| 1         | 23CS501     | Computer Networks                 | PCC      | 3                | 0 | 2  | 5                     | 4       |
| 2         | 23AD503     | Deep Learning for Computer Vision | PCC      | 3                | 0 | 2  | 5                     | 4       |
| 3         | 23IT501     | Web Essentials                    | PCC      | 3                | 0 | 2  | 5                     | 4       |
| 4         |             | Open Elective - I~                | OEC      | 3                | 0 | 0  | 3                     | 3~      |
| 5         |             | Professional Elective – I         | PEC      | 2                | 0 | 2  | 4                     | 3       |
| 6         |             | Professional Elective – II        | PEC      | 2                | 0 | 2  | 4                     | 3       |
| 7         |             | Mandatory Course *                | MC       | 3                | 0 | 0  | 3                     | 0*      |
| PRACTICAL |             |                                   |          |                  |   |    |                       |         |
| 8         | 23IT511     | Summer Internship – I             | EEC      | 0                | 0 | 0  | 0                     | 2       |
| TOTAL     |             |                                   |          | 19               | 0 | 10 | 29                    | 23      |

~ Open Elective - I shall be chosen from the list of open electives offered by other Programmes.

## SEMESTER VI

| S. NO.    | COURSE CODE | COURSE TITLE                | CATEGORY | PERIODS PER WEEK |   |    | TOTAL CONTACT PERIODS | CREDITS |
|-----------|-------------|-----------------------------|----------|------------------|---|----|-----------------------|---------|
|           |             |                             |          | L                | T | P  |                       |         |
| THEORY    |             |                             |          |                  |   |    |                       |         |
| 1         | 23IT601     | Full Stack Web Development  | PCC      | 3                | 0 | 2  | 5                     | 4       |
| 2         | 23CS902     | Distributed Computing       | PCC      | 3                | 0 | 0  | 3                     | 3       |
| 3         | 23CS903     | Embedded Systems and IoT    | PCC      | 3                | 0 | 2  | 5                     | 4       |
| 4         |             | Open Elective - II~         | OEC      | 3                | 0 | 0  | 3                     | 3~      |
| 5         |             | Professional Elective – III | PEC      | 2                | 0 | 2  | 4                     | 3       |
| 6         |             | Professional Elective – IV  | PEC      | 2                | 0 | 2  | 4                     | 3       |
| PRACTICAL |             |                             |          |                  |   |    |                       |         |
| 7         | 23IT611     | Mini Project                | EEC      | 0                | 0 | 4  | 4                     | 2       |
| TOTAL     |             |                             |          | 16               | 0 | 12 | 28                    | 22      |

~ Open Elective - II shall be chosen from the list of open electives offered by other Programmes.

\* Mandatory Course are Non-credit Courses (Student shall select one course from the list given under Mandatory Courses)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## SEMESTER VII

| S. NO.     | COURSE CODE | COURSE TITLE                            | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS |
|------------|-------------|-----------------------------------------|----------|------------------|---|---|-----------------------|---------|
|            |             |                                         |          | L                | T | P |                       |         |
| THEORY     |             |                                         |          |                  |   |   |                       |         |
| 1          | 23GE902     | Human Values and Ethics                 | HSMC     | 2                | 0 | 0 | 2                     | 2       |
| 2          | 23IT701     | Mobile Application Development          | PCC      | 3                | 0 | 2 | 5                     | 4       |
| 3          |             | Elective - Management &                 | HSMC     | 3                | 0 | 0 | 3                     | 3&      |
| 4          |             | Open Elective - III~                    | OEC      | 3                | 0 | 0 | 3                     | 3~      |
| 5          |             | Professional Elective – V               | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 6          |             | Professional Elective – VI              | PEC      | 2                | 0 | 2 | 4                     | 3       |
| PRACTICALS |             |                                         |          |                  |   |   |                       |         |
| 7          | 23IT711     | Research Paper Writing and Publications | EEC      | 0                | 0 | 2 | 2                     | 1       |
| 8          | 23IT712     | Summer Internship – II                  | EEC      | 0                | 0 | 0 | 0                     | 2       |
| TOTAL      |             |                                         |          | 15               | 0 | 8 | 23                    | 21      |

& Elective - Management shall be chosen from the Elective Management courses.

~ Open Elective - III shall be chosen from the list of open electives offered by other Programmes.

## SEMESTER VIII

| S. NO.    | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK |   |    | TOTAL CONTACT PERIODS | CREDITS |
|-----------|-------------|--------------|----------|------------------|---|----|-----------------------|---------|
|           |             |              |          | L                | T | P  |                       |         |
| PRACTICAL |             |              |          |                  |   |    |                       |         |
| 1         | 23IT811     | Project Work | EEC      | 0                | 0 | 20 | 20                    | 10      |
| TOTAL     |             |              |          | 0                | 0 | 20 | 20                    | 10      |

TOTAL CREDITS: 163

## XI – Elective - Management Courses

| S. NO. | COURSE CODE | COURSE TITLE                                   | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS |
|--------|-------------|------------------------------------------------|----------|------------------|---|---|-----------------------|---------|
|        |             |                                                |          | L                | T | P |                       |         |
| 1.     | 23GE701     | Principles of Management                       | HSMC     | 3                | 0 | 0 | 3                     | 3       |
| 2.     | 23GE702     | Total Quality Management                       | HSMC     | 3                | 0 | 0 | 3                     | 3       |
| 3.     | 23GE703     | Engineering Economics and Financial Accounting | HSMC     | 3                | 0 | 0 | 3                     | 3       |
| 4.     | 23GE704     | Human Resource Management                      | HSMC     | 3                | 0 | 0 | 3                     | 3       |
| 5.     | 23GE705     | Knowledge Management                           | HSMC     | 3                | 0 | 0 | 3                     | 3       |
| 6.     | 23GE706     | Industrial Management                          | HSMC     | 3                | 0 | 0 | 3                     | 3       |

## XII – Elective - Mandatory Courses

| S. NO. | COURSE CODE | COURSE TITLE                                                     | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS |
|--------|-------------|------------------------------------------------------------------|----------|------------------|---|---|-----------------------|---------|
|        |             |                                                                  |          | L                | T | P |                       |         |
| 1.     | 23MC901     | English for Communication                                        | MC       | 3                | 0 | 0 | 3                     | 0       |
| 2.     | 23MC902     | Introduction to Women and Gender Studies                         | MC       | 3                | 0 | 0 | 3                     | 0       |
| 3.     | 23MC903     | Disaster Risk Reduction and Management                           | MC       | 3                | 0 | 0 | 3                     | 0       |
| 4.     | 23MC904     | History of Science and Technology in India                       | MC       | 3                | 0 | 0 | 3                     | 0       |
| 5.     | 23MC905     | Political and Economic Thought for a Human Society               | MC       | 3                | 0 | 0 | 3                     | 0       |
| 6.     | 23MC906     | Well Being with Traditional Practices- Yoga, Ayurveda and Siddha | MC       | 3                | 0 | 0 | 3                     | 0       |
| 7.     | 23MC907     | State, Nation Building and Politics in India                     | MC       | 3                | 0 | 0 | 3                     | 0       |
| 8.     | 23MC908     | Industrial Safety                                                | MC       | 3                | 0 | 0 | 3                     | 0       |
| 9.     | 23MC909     | Indian Constitution                                              | MC       | 3                | 0 | 0 | 3                     | 0       |
| 10.    | 23MC910     | Elements of Literature                                           | MC       | 3                | 0 | 0 | 3                     | 0       |



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## XIII - PROFESSIONAL ELECTIVE COURSES: VERTICALS

| Vertical I<br>Data Science           | Vertical II<br>Full Stack<br>Development for<br>IT | Vertical III<br>Cloud Computing<br>and Data Centre<br>Technologies | Vertical IV<br>Cyber Security and<br>Data Privacy | Vertical V<br>Creative Media                  | Vertical VI<br>Emerging<br>Technologies          | Vertical VII<br>Artificial<br>Intelligence and<br>Machine Learning |
|--------------------------------------|----------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------|
| Exploratory Data<br>Analysis         | Cloud Computing                                    | Cloud Computing                                                    | Ethical Hacking                                   | Augmented<br>Reality/Virtual<br>Reality       | Augmented<br>Reality/Virtual<br>Reality          | Knowledge<br>Engineering                                           |
| Recommender<br>Systems               | App Development                                    | Virtualization                                                     | Digital and Mobile<br>Forensics                   | Multimedia and<br>Animation                   | Robotic Process<br>Automation                    | Soft Computing                                                     |
| Neural Networks and<br>Deep Learning | Cloud Services<br>Management                       | Cloud Services<br>Management                                       | Social Network<br>Security                        | Video Creation<br>and Editing                 | Neural Networks<br>and Deep Learning             | Neural Networks<br>and Deep Learning                               |
| Text and<br>Speech Analysis          | UI and UX Design                                   | Data Warehousing                                                   | Modern Cryptography                               | UI and UX Design                              | Cyber security                                   | Text and<br>Speech Analysis                                        |
| Business Analytics                   | Software Testing<br>and Automation                 | Storage<br>Technologies                                            | Engineering Secure<br>Software Systems            | Digital marketing                             | Quantum<br>Computing                             | Optimization<br>Techniques                                         |
| Image and Video<br>Analytics         | Web Application<br>Security                        | Software Defined<br>Networks                                       | Cryptocurrency and<br>Blockchain Technologies     | Visual Effects                                | Cryptocurrency and<br>Blockchain<br>Technologies | Game Theory                                                        |
| Computer Vision                      | DevOps                                             | Stream Processing                                                  | Network Security                                  | Game<br>Development                           | Game<br>Development                              | Cognitive Science                                                  |
| Big data Analytics                   | Principles of<br>Programming<br>Languages          | Security and Privacy in<br>Cloud                                   | Security and Privacy in<br>Cloud                  | Multimedia Data<br>Compression and<br>Storage | 3D Printing and Design                           | Ethics And AI                                                      |

**Registration of Professional Elective Courses from verticals:**

Professional Elective Courses will be registered in Semesters V, VI and VII. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled one Semester and another one course in another semester. The registration of courses for B.E. / B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E./B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2023, Clause 18.

Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

**PROFESSIONAL ELECTIVE COURSES**  
**VERTICALS**

**VERTICAL 1: DATA SCIENCE**

| S. No. | COURSE CODE | COURSE TITLE                      | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS |
|--------|-------------|-----------------------------------|----------|------------------|---|---|-----------------------|---------|
|        |             |                                   |          | L                | T | P |                       |         |
| 1.     | 23PAD02     | Exploratory Data Analysis         | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 2.     | 23PAD06     | Recommender Systems               | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 3.     | 23PAD05     | Neural Networks and Deep Learning | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 4.     | 23PAD07     | Text and Speech Analysis          | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 5.     | 23PAD01     | Business Analytics                | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 6.     | 23PAD04     | Image and Video Analytics         | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 7.     | 23PAD902    | Computer Vision                   | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 8.     | 23AD901     | Big data Analytics                | PEC      | 2                | 0 | 2 | 4                     | 3       |

**VERTICAL 2: FULL STACK DEVELOPMENT FOR IT**

| S. No. | COURSE CODE | COURSE TITLE                        | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS |
|--------|-------------|-------------------------------------|----------|------------------|---|---|-----------------------|---------|
|        |             |                                     |          | L                | T | P |                       |         |
| 1.     | 23CS905     | Cloud Computing                     | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 2.     | 23PIT02     | App Development                     | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 3.     | 23PIT03     | Cloud Services Management           | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 4.     | 23PIT04     | UI and UX Design                    | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 5.     | 23PIT05     | Software Testing and Automation     | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 6.     | 23PIT06     | Web Application Security            | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 7.     | 23PIT07     | DevOps                              | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 8.     | 23PIT08     | Principles of Programming Languages | PEC      | 2                | 0 | 2 | 4                     | 3       |



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul - 624401

**VERTICAL 3: CLOUD COMPUTING AND DATA CENTRE TECHNOLOGIES**

| S. No. | COURSE CODE | COURSE TITLE                  | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS |
|--------|-------------|-------------------------------|----------|------------------|---|---|-----------------------|---------|
|        |             |                               |          | L                | T | P |                       |         |
| 1.     | 23CS905     | Cloud Computing               | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 2.     | 23PCS01     | Virtualization                | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 3.     | 23PIT03     | Cloud Services Management     | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 4.     | 23PCS02     | Data Warehousing              | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 5.     | 23PCS03     | Storage Technologies          | PEC      | 3                | 0 | 0 | 3                     | 3       |
| 6.     | 23PCS04     | Software Defined Networks     | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 7.     | 23PCS05     | Stream Processing             | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 8.     | 23PCS06     | Security and Privacy in Cloud | PEC      | 2                | 0 | 2 | 4                     | 3       |

**VERTICAL 4: CYBER SECURITY AND DATA PRIVACY**

| S. No. | COURSE CODE | COURSE TITLE                               | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS |
|--------|-------------|--------------------------------------------|----------|------------------|---|---|-----------------------|---------|
|        |             |                                            |          | L                | T | P |                       |         |
| 1.     | 23PCS07     | Ethical Hacking                            | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 2.     | 23PCS08     | Digital and Mobile Forensics               | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 3.     | 23PCS09     | Social Network Security                    | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 4.     | 23PCS10     | Modern Cryptography                        | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 5.     | 23PCS11     | Engineering Secure Software Systems        | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 6.     | 23PCS12     | Cryptocurrency and Blockchain Technologies | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 7.     | 23PCS13     | Network Security                           | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 8.     | 23PCS06     | Security and Privacy in Cloud              | PEC      | 2                | 0 | 2 | 4                     | 3       |



## VERTICAL 5: CREATIVE MEDIA

| S. No. | COURSE CODE | COURSE TITLE                            | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS |
|--------|-------------|-----------------------------------------|----------|------------------|---|---|-----------------------|---------|
|        |             |                                         |          | L                | T | P |                       |         |
| 1.     | 23PCS14     | Augmented Reality / Virtual Reality     | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 2.     | 23PCS15     | Multimedia and Animation                | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 3.     | 23PCS16     | Video Creation and Editing              | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 4.     | 23PIT04     | UI and UX Design                        | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 5.     | 23PCS17     | Digital marketing                       | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 6.     | 23PCS18     | Visual Effects                          | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 7.     | 23PCS19     | Game Development                        | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 8.     | 23PCS20     | Multimedia Data Compression and Storage | PEC      | 2                | 0 | 2 | 4                     | 3       |

## VERTICAL 6: EMERGING TECHNOLOGIES

| S. No. | COURSE CODE | COURSE TITLE                               | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS |
|--------|-------------|--------------------------------------------|----------|------------------|---|---|-----------------------|---------|
|        |             |                                            |          | L                | T | P |                       |         |
| 1.     | 23PCS14     | Augmented Reality / Virtual Reality        | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 2.     | 23CS906     | Robotic Process Automation                 | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 3.     | 23PAD05     | Neural Networks and Deep Learning          | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 4.     | 23PCS21     | Cyber security                             | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 5.     | 23PCS22     | Quantum Computing                          | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 6.     | 23PCS12     | Cryptocurrency and Blockchain Technologies | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 7.     | 23PCS19     | Game Development                           | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 8.     | 23PCS23     | 3D Printing and Design                     | PEC      | 2                | 0 | 2 | 4                     | 3       |



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## VERTICAL 7: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

| S. No. | COURSE CODE | COURSE TITLE                      | CATEGORY | PERIODS PER WEEK |   |   | TOTAL CONTACT PERIODS | CREDITS |
|--------|-------------|-----------------------------------|----------|------------------|---|---|-----------------------|---------|
|        |             |                                   |          | L                | T | P |                       |         |
| 1.     | 23PAD09     | Knowledge Engineering             | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 2.     | 23PAD08     | Soft Computing                    | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 3.     | 23PAD05     | Neural Networks and Deep Learning | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 4.     | 23PAD07     | Text and Speech Analysis          | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 5.     | 23PAD10     | Optimization Techniques           | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 6.     | 23PAD11     | Game Theory                       | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 7.     | 23PAD13     | Cognitive Science                 | PEC      | 2                | 0 | 2 | 4                     | 3       |
| 8.     | 23PAD17     | Ethics and AI                     | PEC      | 2                | 0 | 2 | 4                     | 3       |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul-624401

## XIV - OPEN ELECTIVES

| S. No. | Course Code | Course Title                                     | Category | Periods Per Week |   |   | Contact Periods | Credits |
|--------|-------------|--------------------------------------------------|----------|------------------|---|---|-----------------|---------|
|        |             |                                                  |          | L                | T | P |                 |         |
| 1.     | 23OCE01     | Cartography & GIS                                | OEC      | 3                | 0 | 0 | 3               | 3       |
| 2.     | 23OCE02     | Environment, Health & Safety                     | OEC      | 3                | 0 | 0 | 3               | 3       |
| 3.     | 23OCE03     | Environment Impact Assessment                    | OEC      | 3                | 0 | 0 | 3               | 3       |
| 4.     | 23OCE04     | Industrial waste water management                | OEC      | 3                | 0 | 0 | 3               | 3       |
| 5.     | 23OCE05     | Remote sensing concepts                          | OEC      | 3                | 0 | 0 | 3               | 3       |
| 6.     | 23OEC01     | Antenna Fundamentals                             | OEC      | 3                | 0 | 0 | 3               | 3       |
| 7.     | 23OEC02     | Consumer Electronics                             | OEC      | 3                | 0 | 0 | 3               | 3       |
| 8.     | 23OEC03     | Display Devices Fundamentals                     | OEC      | 3                | 0 | 0 | 3               | 3       |
| 9.     | 23OEC04     | Basics of Embedded Systems                       | OEC      | 3                | 0 | 0 | 3               | 3       |
| 10.    | 23OEC05     | Basics of Nano Electronics                       | OEC      | 3                | 0 | 0 | 3               | 3       |
| 11.    | 23OEC06     | Fundamentals of Image Processing                 | OEC      | 3                | 0 | 0 | 3               | 3       |
| 12.    | 23OEC07     | Internet of Things                               | OEC      | 3                | 0 | 0 | 3               | 3       |
| 13.    | 23OEC08     | Sensors and Actuators                            | OEC      | 3                | 0 | 0 | 3               | 3       |
| 14.    | 23OEC09     | Wearable Devices                                 | OEC      | 3                | 0 | 0 | 3               | 3       |
| 15.    | 23OEC10     | Wireless Sensor Networks                         | OEC      | 3                | 0 | 0 | 3               | 3       |
| 16.    | 23OEE01     | AI with MATLAB                                   | OEC      | 3                | 0 | 0 | 3               | 3       |
| 17.    | 23OEE02     | Applied Soft Computing                           | OEC      | 3                | 0 | 0 | 3               | 3       |
| 18.    | 23OEE03     | Electric Vehicle Technology                      | OEC      | 3                | 0 | 0 | 3               | 3       |
| 19.    | 23OEE04     | Electrical Safety                                | OEC      | 3                | 0 | 0 | 3               | 3       |
| 20.    | 23OEE05     | E-waste Management                               | OEC      | 3                | 0 | 0 | 3               | 3       |
| 21.    | 23OEE06     | Industrial Automation                            | OEC      | 3                | 0 | 0 | 3               | 3       |
| 22.    | 23OEE07     | Power Plant Instrumentation                      | OEC      | 3                | 0 | 0 | 3               | 3       |
| 23.    | 23OEE08     | Principles of Robotics                           | OEC      | 3                | 0 | 0 | 3               | 3       |
| 24.    | 23OEE09     | Sensors and Transducers                          | OEC      | 3                | 0 | 0 | 3               | 3       |
| 25.    | 23OEE10     | Solar and Wind Energy Resources                  | OEC      | 3                | 0 | 0 | 3               | 3       |
| 26.    | 23OME01     | Energy Conservation and Management               | OEC      | 3                | 0 | 0 | 3               | 3       |
| 27.    | 23OME02     | Energy Technology                                | OEC      | 3                | 0 | 0 | 3               | 3       |
| 28.    | 23OME03     | Engineering Graphics Design                      | OEC      | 3                | 0 | 0 | 3               | 3       |
| 29.    | 23OME04     | Foundation of Robotics                           | OEC      | 3                | 0 | 0 | 3               | 3       |
| 30.    | 23OME05     | Industrial Design & Rapid Prototyping Techniques | OEC      | 3                | 0 | 0 | 3               | 3       |
| 31.    | 23OME06     | Industrial Management                            | OEC      | 3                | 0 | 0 | 3               | 3       |
| 32.    | 23OME07     | Industrial Safety and Hazard Management          | OEC      | 3                | 0 | 0 | 3               | 3       |
| 33.    | 23OME08     | Introduction to Industrial Automation Systems    | OEC      | 3                | 0 | 0 | 3               | 3       |
| 34.    | 23OME09     | Introduction to Non-Destructive Testing          | OEC      | 3                | 0 | 0 | 3               | 3       |
| 35.    | 23OME10     | Mechatronics                                     | OEC      | 3                | 0 | 0 | 3               | 3       |

Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

| S. No. | Course Code | Course Title                         | Category | Periods Per Week |   |   | Contact Periods | Credits |
|--------|-------------|--------------------------------------|----------|------------------|---|---|-----------------|---------|
|        |             |                                      |          | L                | T | P |                 |         |
| 36.    | 23OME11     | Nanomaterials and applications       | OEC      | 3                | 0 | 0 | 3               | 3       |
| 37.    | 23OME12     | Nano Technology                      | OEC      | 3                | 0 | 0 | 3               | 3       |
| 38.    | 23OME13     | Operations Management                | OEC      | 3                | 0 | 0 | 3               | 3       |
| 39.    | 23OME14     | Production Planning and Control      | OEC      | 3                | 0 | 0 | 3               | 3       |
| 40.    | 23OME15     | Quality Engineering                  | OEC      | 3                | 0 | 0 | 3               | 3       |
| 41.    | 23OME16     | Sustainable Manufacturing            | OEC      | 3                | 0 | 0 | 3               | 3       |
| 42.    | 23OMA01     | Algebra and Number Theory            | OEC      | 3                | 0 | 0 | 3               | 3       |
| 43.    | 23OMA02     | Graph Theory                         | OEC      | 3                | 0 | 0 | 3               | 3       |
| 44.    | 23OMA03     | Linear Algebra                       | OEC      | 3                | 0 | 0 | 3               | 3       |
| 45.    | 23OMA04     | Operations Research                  | OEC      | 3                | 0 | 0 | 3               | 3       |
| 46.    | 23OMA05     | Queuing and Reliability Modelling    | OEC      | 3                | 0 | 0 | 3               | 3       |
| 47.    | 23OMA06     | Resource Management Techniques       | OEC      | 3                | 0 | 0 | 3               | 3       |
| 48.    | 23OHS01     | English for Competitive Examinations | OEC      | 3                | 0 | 0 | 3               | 3       |
| 49.    | 23OHS02     | Project Report Writing               | OEC      | 3                | 0 | 0 | 3               | 3       |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## XV – SUMMARY OF CURRICULUM COMPONENTS WITH CREDITS

| COURSE COMPONENTS | CREDITS PER SEMESTER |           |           |           |           |           |           |           | TOTAL CREDITS | NO. OF SUBJECTS | CREDIT WEIGHTAGE |
|-------------------|----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------------|-----------------|------------------|
|                   | I                    | II        | III       | IV        | V         | VI        | VII       | VIII      |               |                 |                  |
| HSMC              | 4                    | 3         |           |           |           |           | 5         |           | 12            | 6               | 7.36             |
| BSC               | 12                   | 9         | 4         |           |           |           |           |           | 25            | 8               | 15.34            |
| ESC               | 4                    | 4.5       | 4         |           |           |           |           |           | 12.5          | 4               | 7.67             |
| PCC               |                      | 4.5       | 13        | 23        | 12        | 11        | 4         |           | 67.5          | 22              | 41.41            |
| PEC               |                      |           |           |           | 6         | 6         | 6         |           | 18            | 6               | 11.04            |
| OEC               |                      |           |           |           | 3         | 3         | 3         |           | 9             | 3               | 5.52             |
| EEC               | 1                    | 1         |           |           | 2         | 2         | 3         | 10        | 19            | 7               | 11.66            |
| MC                |                      |           |           |           | ✓         |           |           |           | 0             | 1               | 0.00             |
| <b>TOTAL</b>      | <b>21</b>            | <b>22</b> | <b>21</b> | <b>23</b> | <b>23</b> | <b>21</b> | <b>22</b> | <b>10</b> | <b>163</b>    | <b>57</b>       | <b>100</b>       |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23HS101 - PROFESSIONAL ENGLISH - I

| Prerequisite | Program Name                          | Sem | Category | L | T | P | C |
|--------------|---------------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E./B.TECH. – Common to All Branches | I   | HSMC     | 3 | 0 | 0 | 3 |

## II - Course Objectives

|    |                                                                                                                                 |
|----|---------------------------------------------------------------------------------------------------------------------------------|
| 1. | To improve the communicative competence of learners.                                                                            |
| 2. | To learn to use basic grammatic structures in suitable contexts.                                                                |
| 3. | To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text.                  |
| 4. | To help learners use language effectively in professional contexts.                                                             |
| 5. | To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals. |

## III - Course Content

**Preamble:**

This course is designed to impart required levels of Communication Skills in Reading and Writing and Proficiency in English language in writing necessary for different professional contexts.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>INTRODUCTION TO EFFECTIVE COMMUNICATION</b> | <b>9 Periods</b> |
| Fundamentals of Communication- effective communication- seven C's of effective communication<br><b>Reading</b> - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. <b>Writing</b> - Writing emails / letters. <b>Grammar</b> – Simple Tenses (Present / Past /Future); Question types: Wh/ Yes or No/- Question Tags. <b>Vocabulary</b> – Synonyms (word -meaning-sentence making); (One word substitution; Abbreviations & Acronyms (as used in technical contexts) – Silent letters |                                                |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>NARRATION AND SUMMATION</b>                 | <b>9 Periods</b> |
| <b>Reading</b> - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. <b>Writing</b> - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) <b>Grammar</b> –Progressive tenses (Present / Past /Future); Subject-Verb Agreement; Prepositions. <b>Vocabulary</b> - Wordforms (prefixes& suffixes); Phrasal verbs.                                                                                                                                                               |                                                |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>DESCRIPTION OF A PROCESS / PRODUCT</b>      | <b>9 Periods</b> |
| <b>Reading</b> – Reading advertisements, gadget reviews; user manuals. <b>Writing</b> - Writing definitions; instructions; and Product /Process description. <b>Grammar</b> - Imperatives; Adjectives; Degrees of comparison; Perfect Tenses (Present / Past /Future); <b>Vocabulary</b> - Compound Nouns, Homonyms; and Homophones.                                                                                                                                                                                                                             |                                                |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>CLASSIFICATION AND RECOMMENDATIONS</b>      | <b>9 Periods</b> |
| <b>Reading</b> – Newspaper articles; Journal reports –and Non-Verbal Communication (tables, pie charts etc,) Note-making. <b>Writing</b> –Writing recommendations; Transferring information from non-verbal (chart, graph etc, to verbal mode), Transcoding, <b>Grammar</b> – Perfect continuous tenses (Present / Past /Future); Articles; Pronouns - Possessive & Relative pronouns. <b>Vocabulary</b> - Collocations; Fixed / Semi fixed expressions – Idioms and Phrases                                                                                     |                                                |                  |

| Unit – V                                                                                                                                                                                                                                                                                                                         | EXPRESSION | 9 Periods |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|
| <b>Reading</b> – Reading editorials; and Opinion Blogs; <b>Writing</b> – Essay Writing (Descriptive or narrative).<br><b>Grammar</b> – Punctuation; Simple, Compound & Complex Sentences. <b>Vocabulary</b> - Cause & Effect Expressions – Content vs Function words – British & American vocabulary (spelling and word changes) |            |           |

Total: 45 Periods

|                            |                                                                                                                                                                                                                                        |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | [1] English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2023 edition)                                                                                                         |
|                            | [2] English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Jovani, Department of English, Anna University. |
| <b>Reference Books:</b>    | [1] Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw-Hill India, 2017.                                                                                                                                           |
|                            | [2] A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.                                                                                                                                     |
|                            | [3] English For Technical Communication (With CD) By Aysha Viswamohan, McGraw Hill Education, ISBN : 0070264244.                                                                                                                       |
|                            | [4] Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House                                                                                                                                                |
|                            | [5] Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.                                                                                                                                             |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc23_hs115/preview">https://onlinecourses.nptel.ac.in/noc23_hs115/preview</a>                                                                                                              |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | To use appropriate words in a professional context and communicate in a professional context.                                                             | Apply (K3)           |
| CO2                                                       | To gain understanding of basic grammatic structures and use them in right context.                                                                        | Understand (K2)      |
| CO3                                                       | To read and infer the denotative and connotative meanings of technical texts and use technical words in describing products with appropriate definitions. | Apply (K3)           |
| CO4                                                       | To write definitions, descriptions, narrations and essays on various topics.                                                                              | Create (K6)          |
| CO5                                                       | To express their opinions effectively in both oral and written medium of communication.                                                                   | Create (K6)          |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

V – Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO2         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO3         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO4         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO5         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

**I - Course Name: 23MA101 - MATRICES AND CALCULUS**

| Prerequisite | Program Name                          | Sem | Category | L | T | P | C |
|--------------|---------------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E./B.TECH. - Common to All Branches | I   | BSC      | 3 | 1 | 0 | 4 |

**II - Course Objectives**

|    |                                                                                                                              |
|----|------------------------------------------------------------------------------------------------------------------------------|
| 1. | To develop the use of matrix algebra techniques that is needed by engineers for practical applications.                      |
| 2. | To familiarize the student with functions of several variables. This is needed in many branches of engineering.              |
| 3. | To familiarize the students with integral calculus and various techniques of integration.                                    |
| 4. | To make the students understand the concepts of vector calculus and applications.                                            |
| 5. | To acquaint the student with mathematical tools needed in evaluating ordinary differential equations and their applications. |

**III - Course Content****Preamble:**

This course introduces basic concepts and techniques of multivariable calculus, matrices, and ordinary differential equations and highlights their applications in various field of engineering such as Design Engineering, Electric Circuit Theory, Cryptography, Resistor conversion, Robotics etc

| Unit – I                                                                                                                                                                                                                                                                                                                                                        | MATRICES                                 | 12 Periods |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------|
| Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley – Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms                                          |                                          |            |
| Unit – II                                                                                                                                                                                                                                                                                                                                                       | FUNCTIONS OF SEVERAL VARIABLES           | 12 Periods |
| Partial differentiation – Homogeneous functions and Euler’s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange’s method of undetermined multipliers.                    |                                          |            |
| Unit – III                                                                                                                                                                                                                                                                                                                                                      | INTEGRAL CALCULUS AND MULTIPLE INTEGRALS | 12 Periods |
| Definite integrals – Properties – Problems- Double and Triple integrals – Cartesian, polar coordinates – change of order of integration – Applications: Area between curves, Volume of integrals.                                                                                                                                                               |                                          |            |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                       | VECTOR CALCULUS                          | 12 Periods |
| Gradients - Divergence - Curl – Directional derivative - Irrotational and Solenoidal vector fields– Vector Integration (Line integral, Surface integral, Volume integral, Simple Problems only) – Green’s theorem in plane, Gauss divergence theorem and Stoke’s Theorem (excluding proof) – Simple applications involving cubes and rectangular parallelopeds. |                                          |            |
| Unit – V                                                                                                                                                                                                                                                                                                                                                        | ORDINARY DIFFERENTIAL EQUATIONS          | 12 Periods |
| Higher order linear differential equations with constant coefficients – Method of variation of parameters. Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.                                                                                                                |                                          |            |

Total: 60 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <p>[1] Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.</p> <p>[2] Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.</p> <p>[3] James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II &amp; IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8 ].</p>                                                                                                                                                                                                                                                                                                               |
| <b>Reference Books:</b>    | <p>[1] Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016.</p> <p>[2] Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.</p> <p>[3] Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.</p> <p>[4] Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.</p> <p>[5] Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.</p> <p>[6] Srimantha Pal and Bhunia. S.C, "Engineering Mathematics " Oxford University Press, 2015.</p> <p>[7] Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.</p> |
| <b>MOOC/Web Platforms:</b> | <p><a href="https://nptel.ac.in/courses/122104018">https://nptel.ac.in/courses/122104018</a></p> <p><a href="https://archive.nptel.ac.in/courses/111/106/111106146/">https://archive.nptel.ac.in/courses/111/106/111106146/</a></p> <p><a href="https://onlinecourses.nptel.ac.in/noc21_ma16/preview">https://onlinecourses.nptel.ac.in/noc21_ma16/preview</a></p> <p><a href="https://digimat.in/nptel/courses/video/111105122/L01.html">https://digimat.in/nptel/courses/video/111105122/L01.html</a></p>                                                                                                                                                                                                                                                                                                                                                                  |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Use the matrix algebra methods for solving practical problems.                                                | Apply (K3)           |
| CO2                                                       | Able to use differential calculus ideas on several variable functions.                                        | Apply (K3)           |
| CO3                                                       | Apply integral calculus and multiple integral tools in solving various application problems.                  | Apply (K3)           |
| CO4                                                       | Understand the concepts of Gradient, divergence and curl of a vector point function and related applications. | Understand (K2)      |
| CO5                                                       | Apply various techniques in solving ordinary differential equations.                                          | Apply (K3)           |



## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 1   | 1   | -   | -   | -   | -   | 2   | -    | 2    | 3    | -    | -    | -    |
| CO2         | 3   | 3   | 1   | 1   | -   | -   | -   | -   | 2   | -    | 2    | 3    | -    | -    | -    |
| CO3         | 3   | 3   | 1   | 1   | -   | -   | -   | -   | 2   | -    | 2    | 3    | -    | -    | -    |
| CO4         | 3   | 3   | 1   | 1   | -   | -   | -   | -   | 2   | -    | 2    | 3    | -    | -    | -    |
| CO5         | 3   | 3   | -   | -   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul - 624401

**I - Course Name: 23PH101 - ENGINEERING PHYSICS**

| Prerequisite | Program Name                                                   | Sem | Category | L | T | P | C |
|--------------|----------------------------------------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E./B.TECH. - Common for CIVIL, CSE, EEE, MECH, IT, and AI&DS | I   | BSC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|    |                                                                                             |
|----|---------------------------------------------------------------------------------------------|
| 1. | To instill the essentials of properties of matter.                                          |
| 2. | To gain knowledge of electromagnetic waves and its applications.                            |
| 3. | To amplify the information on optical fiber for communication purposes.                     |
| 4. | To describe the principles of quantum mechanics and their various applications.             |
| 5. | To provide the fundamental understanding of crystals and their numerous crystal formations. |

**III - Course Content****Preamble:**

The aim of the Engineering Physics Program is to offer students a solid background in the fundamentals of Physics and to impart that knowledge in engineering disciplines. The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes.

| Unit – I                                                                                                                                                                                                                                                                                                           | PROPERTIES OF MATTER            | 9 Periods |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------|
| Elasticity – stress - strain - Hooke 's law- S-S diagram - factors affecting elastic modulus and tensile strength – Torsion pendulum - moment of inertia of a body - young's modulus – cantilever method, uniform and non-uniform bending – I-shaped girders - Poisson's ratio.                                    |                                 |           |
| Unit – II                                                                                                                                                                                                                                                                                                          | ELECTROMAGNETIC FIELD AND WAVES | 9 Periods |
| The Maxwell's equations - wave equation; plane electromagnetic waves in vacuum, conditions on the wave field - properties of electromagnetic waves - energy and momentum in EM waves: intensity, waves from localized sources, momentum and radiation pressure – smart phone reception.                            |                                 |           |
| Unit – III                                                                                                                                                                                                                                                                                                         | LASER AND FIBER OPTICS          | 9 Periods |
| LASER- interaction of light radiation with materials - Einstein's coefficients - Nd:YAG, CO <sub>2</sub> , quantum dot laser – LIDAR.<br>Fiber optics: modes of propagation of light – numerical aperture and acceptance angle - fiber optical communication system - fiber optic displacement sensors.            |                                 |           |
| Unit – IV                                                                                                                                                                                                                                                                                                          | QUANTUM PHYSICS                 | 9 Periods |
| Comparison between classical and quantum theory – Compton scattering: experimental description-uncertainty principle – physical significance of wave function - Schrödinger's wave equation – time dependent and time independent equations – particle in a box - quantum confinement.                             |                                 |           |
| Unit – V                                                                                                                                                                                                                                                                                                           | CRYSTAL PHYSICS                 | 9 Periods |
| Crystallography – unit cell, primitive cell - crystal systems, Bravais lattices, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP structures- diamond & NaCl Crystal structure - crystal defect and dislocation. crystal growth techniques: Bridgman method. |                                 |           |

**Total : 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Books for study &amp; Reference:</b> | [1] Tipler Mosca, Physics For Scientists and Engineers 6th Edition, 2015<br>[2] Gaur R.K. and Gupta S.L, Engineering Physics, Dhanpat Rai Publications, 2013.<br>[3] Bhattacharya D.K. & Poonam T., Engineering Physics, Oxford University Press, 2015.<br>[4] S. O. Pillai, Solid State Physics, New Age International Private Limited, 10 <sup>th</sup> edition, 2022<br>Marikani A, Engineering Physics, PHI, New Delhi, 2013.                                                                                                                                                                                                                                             |
| <b>MOOC/Web Platforms:</b>              | <a href="https://onlinecourses.nptel.ac.in/noc20_mm13/preview">https://onlinecourses.nptel.ac.in/noc20_mm13/preview</a><br><a href="https://www.noaa.gov/jetstream/satellites/electromagnetic-waves">https://www.noaa.gov/jetstream/satellites/electromagnetic-waves</a><br><a href="https://fractory.com/fibre-lasers-explained/">https://fractory.com/fibre-lasers-explained/</a><br><a href="https://www.livescience.com/33816-quantum-mechanics-explanation.html">https://www.livescience.com/33816-quantum-mechanics-explanation.html</a><br><a href="https://archive.nptel.ac.in/courses/115/104/115104109/">https://archive.nptel.ac.in/courses/115/104/115104109/</a> |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Choose the correct materials based on their qualities for any intended applications and learn the basics of elasticity and its engineering-related applications. | Apply (K3)           |
| <b>CO2</b>                                                | Express their knowledge in electromagnetic waves.                                                                                                                | Understand (K2)      |
| <b>CO3</b>                                                | Infer the characteristics of laser for various Engineering applications and expand the understanding of optical fibers use in communications.                    | Understand (K2)      |
| <b>CO4</b>                                                | Apply quantum theory's sophisticated physics notions to the matter characterization.                                                                             | Apply (K3)           |
| <b>CO5</b>                                                | Know the fundamentals of crystal formations and growth methods.                                                                                                  | Understand (K2)      |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | 3   | 3   | -   | -   | 2   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO2</b>  | 3   | 2   | 3   | 2   | -   | -   | 2   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 3   | 3   | -   | -   | -   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 3   | 2   | -   | -   | 3   | -   | -   | -    | -    | 2    | -    | -    | -    |
| <b>CO5</b>  | 3   | 2   | 3   | 3   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## I - Course Name: 23CY101 - ENGINEERING CHEMISTRY

| Prerequisite | Program Name                          | Sem | Category | L | T | P | C |
|--------------|---------------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E./B.TECH. - Common to All Branches | I   | BSC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|    |                                                                                                                                         |
|----|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To inculcate sound understanding of water quality parameters and water treatment techniques.                                            |
| 2. | To impart knowledge on the basic principles and preparatory methods of nanomaterials.                                                   |
| 3. | To introduce the basic concepts and applications of polymers and composites.                                                            |
| 4. | To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.              |
| 5. | To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices. |

## III - Course Content

## Preamble:

The objective of this course is to bestow the better understanding of basic concepts of chemistry and its applications in Engineering and Technology. This course provides exposure on properties of water and its treatment methods. It also imparts knowledge on properties and application of nano-materials in data storage devices. This course also highlights preparation, properties and applications of polymers and composite materials. It also imparts knowledge on fuel types and applications of energy conversion and storage devices.

| Unit - I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | WATER AND ITS TREATMENT | 9 Periods |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------|
| Water: sources and impurities, water quality parameters: colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: reverse osmosis. Boiler troubles: scale and sludge, boiler corrosion, caustic embrittlement, priming & foaming. Treatment of boiler feed water: internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and external treatment: ion exchange demineralisation and zeolite process. |                         |           |
| Unit - II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | NANO CHEMISTRY          | 9 Periods |
| Basics: distinction between molecules, nanomaterials and bulk materials; size-dependent properties (optical, electrical, mechanical and magnetic); types of nanomaterials: definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.                                                                                      |                         |           |
| Unit - III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | POLYMERS AND COMPOSITES | 9 Periods |
| Introduction: classification of polymers – natural and synthetic; thermoplastic and thermosetting. Functionality – preparation properties and uses of PVC, teflon, nylon 6,6 and epoxy resins. Composites: introduction: definition & need for composites; constitution: matrix materials (Polymer matrix, metal matrix and ceramic matrix) and reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: metal matrix composites (MMC), ceramic matrix composites and polymer matrix composites. Hybrid composites - definition and examples.                               |                         |           |



| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | FUELS AND COMBUSTION   | 9 Periods |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------|
| <p>Fuels: introduction, classification of fuels; coal and coke: analysis of coal (proximate and ultimate), carbonization, manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and diesel: manufacture of synthetic petrol (Bergius process), knocking - octane number, diesel oil - cetane number; power alcohol and biodiesel.</p> <p>Combustion of fuels: introduction: calorific value - higher and lower calorific values, theoretical calculation of calorific value; ignition temperature: spontaneous ignition temperature, explosive range; flue gas analysis - ORSAT Method. CO<sub>2</sub> emission and carbon foot print.</p> |                        |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ENERGY STORAGE DEVICES | 9 Periods |
| <p>Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: principle, working and applications of solar cells; recent developments in solar cell materials. Wind energy; geothermal energy; batteries: types of batteries, primary battery – dry cell, secondary battery -lead acid storage battery and lithium-ion-battery; electric vehicles-working principles; fuel cells: H<sub>2</sub>-O<sub>2</sub> fuel cell, super capacitors</p>                                                                                                                                                                            |                        |           |

Total : 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <p>P. C. Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 17<sup>th</sup> Edition, 2018.</p> <p>Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 6<sup>th</sup> Edition 2012.</p> <p>S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12<sup>th</sup> Edition, 2018.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Reference Books:</b>    | <p>B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.</p> <p>O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2<sup>nd</sup> Edition, 2017.</p> <p>Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2<sup>nd</sup> Edition, 2017.</p> <p>Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2<sup>nd</sup> Edition, 2019.</p> <p>O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2<sup>nd</sup> Edition, 2013.</p> <p>Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science", New Age International P (Ltd.,) Chennai, 4<sup>th</sup> Edition, 2021.</p> |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses">https://nptel.ac.in/courses</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Summarize the water related problems in boilers and their treatment techniques.                                           | Remember (K1)        |
| CO2                                                       | Discuss the applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.                    | Understand (K2)      |
| CO3                                                       | Discuss the types, properties and applications of polymers and composites.                                                | Apply (K3)           |
| CO4                                                       | Summarize the fuels used for engineering processes and applications of fuels.                                             | Understand (K2)      |
| CO5                                                       | Summarize the principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells. | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 1   | 1   | -   | -   | -   | 3   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO2         | 2   | 1   | 1   | -   | -   | -   | 3   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO3         | 2   | 1   | 1   | -   | -   | -   | 3   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO4         | 2   | 1   | 1   | -   | -   | -   | 1   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO5         | 3   | 2   | 2   | -   | -   | -   | 3   | -   | -   | -    | -    | 3    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23GE101-PROBLEM SOLVING AND C PROGRAMMING**

| Prerequisite    | Program Name                                | Sem | Category | L | T | P | C |
|-----------------|---------------------------------------------|-----|----------|---|---|---|---|
| Computer Basics | B.E/B.Tech. – Common to CSE, IT, ECE, & EEE | I   | ESC      | 3 | 0 | 2 | 5 |

**II - Course Objectives**

|    |                                                                                                                                                         |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To understand the fundamentals of Problem solving using Algorithm and Flowchart and teach the basic programming constructs for solving simple Problems. |
| 2. | To introduce the basic concepts of arrays and strings.                                                                                                  |
| 3. | To acquaint the students about functions and pointers.                                                                                                  |
| 4. | To develop applications in C using structures and union.                                                                                                |
| 5. | To impart knowledge on the concepts of file handling.                                                                                                   |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------|
| <b>Preamble:</b> C programmers will always have a scope. There are two aspects, i. C at Application level ii. C at System level. C at application level work is being replaced by Modern Languages. But C at system level is still used very heavily. For system level programs, the programmers should know the platform/processor understanding/knowledge/Assembly, strong data structures and algorithms, hardware understanding, In-Depth OS Knowledge, computer architecture. |                                        |                   |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>INTRODUCTION TO ALGORITHM AND C</b> | <b>10 Periods</b> |
| Algorithms, building blocks of algorithms, notation, algorithmic problem solving, simple strategies for developing algorithms.<br>Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process.                 |                                        |                   |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>UNIT II ARRAYS AND STRINGS</b>      | <b>8 Periods</b>  |
| Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search                                                                                                                                                                                                                                                                             |                                        |                   |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>UNIT III FUNCTIONS AND POINTERS</b> | <b>9 Periods</b>  |
| Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions –Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.                                                                                                                                       |                                        |                   |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>UNIT IV STRUCTURES AND UNION</b>    | <b>9 Periods</b>  |
| Structure - Nested structures – Pointer and Structures – Array of structures – Self referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility.                                                                                                                                                                                                                                                                    |                                        |                   |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>UNIT V FILE PROCESSING</b>          | <b>9 Periods</b>  |
| Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.                                                                                                                                                                                                                                                                                                                                         |                                        |                   |

Total : 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**LIST OF EXPERIMENTS:**

**Note:** The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

1. I/O statements, operators, expressions
2. Decision-making constructs: if-else, goto, switch-case, break-continue
3. Loops: for, while, do-while
4. Arrays: 1D and 2D, Multi-dimensional arrays, traversal
5. Strings: operations
6. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7. Recursion
8. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
9. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
10. Files: reading and writing, File pointers, file operations, random access, processor directives.

**TOTAL: 30 Periods****Total : 45+30 = 75 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.<br>2. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2015.                                                                                                                                                                                                                                                                                                                                    |
| <b>Reference Books:</b>    | 1. B. Gottfried, Programming with C, Schaum Outline Series, Fourth Edition, 2018<br>2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.<br>3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw- Hill Education, 1996.<br>4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.<br>5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013. |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.w3schools.com/">Introduction to C (w3schools.com)</a><br><a href="https://www.programiz.com/c-programming/">Learn C Programming (programiz.com)</a><br><a href="https://www.geeksforgeeks.org/c-tutorial/">C Tutorial - Learn C Programming Language (geeksforgeeks.org)</a>                                                                                                                                                                                                                                    |

**IV - Course Outcomess**

| On completion of the course, the students will be able to |                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the basic concepts of Problem solving and C programming constructs                     | Understand (K2)      |
| <b>CO2</b>                                                | Construct and implement C programs for solving computational Problems using arrays and strings | Apply (K3)           |
| <b>CO3</b>                                                | Develop the simple real-time applications in C using functions and pointers                    | Apply (K3)           |
| <b>CO4</b>                                                | Develop the applications in C using structures                                                 | Apply (K3)           |
| <b>CO5</b>                                                | Develop the applications using file handling.                                                  | Apply (K3)           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 2   | -   | 3   | -   | -   | -   | -   | -    | 2    | -    | 2    | -    | -    |
| CO2         | 3   | 3   | 3   | -   | 3   | -   | -   | -   | -   | -    | 2    | -    | 2    | -    | -    |
| CO3         | 3   | 3   | 2   | -   | 3   | -   | -   | -   | -   | -    | 2    | -    | 2    | -    | -    |
| CO4         | 3   | 2   | 2   | -   | 3   | -   | -   | -   | -   | -    | 2    | -    | 2    | -    | -    |
| CO5         | 3   | 3   | 3   | -   | 3   | -   | -   | -   | -   | -    | 2    | -    | 2    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23GE103 - தமிழர் மரபு /HERITAGE OF TAMILS

| Prerequisite | Program Name                          | Sem | Category | L | T | P | C |
|--------------|---------------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E./B.TECH. - Common to All Branches | I   | HSMC     | 1 | 0 | 0 | 1 |

## II - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                              |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>LANGUAGE AND LITERATURE</b>                                               | <b>3 Periods</b> |
| Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan. |                                                                              |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE</b>               | <b>3 Periods</b> |
| Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yath and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.                                                                                                                               |                                                                              |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>FOLK AND MARTIAL ARTS</b>                                                 | <b>3 Periods</b> |
| Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.                                                                                                                                                                                                                                                                                                                    |                                                                              |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>THINAI CONCEPT OF TAMILS</b>                                              | <b>3 Periods</b> |
| Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.                                                                                                                                                                                          |                                                                              |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE</b> | <b>3 Periods</b> |
| Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.                                                                                                                                                                                                   |                                                                              |                  |

TOTAL: 15 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Cum Books:</b>  | <p>[1] தமிழகவரலாறுமக்களும்பண்பாடும்கே.கே. பிள்ளை (வெளியீடு-தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).</p> <p>[2] கணினித்தமிழ்முனைவர்இலசுந்தரம் (விகடன்பிரசுரம்).</p> <p>[3] கீழடி-வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)</p> <p>[4] பொருதை-ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)</p> <p>[5] Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB &amp; ESC and RMRL – (in print)</p> <p>[6] Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).</p>                                                                                                                                                                                                                                                                                                                                      |
| <b>Reference Books:</b> | <p>[1] Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).</p> <p>[2] The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)</p> <p>[3] Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology &amp; Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)</p> <p>[4] Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)</p> <p>[5] Porunai Civilization (Jointly Published by: Department of Archaeology &amp; Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)</p> <p>[6] Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.</p> |



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

**I - Course Name: 23BS111 - PHYSICS AND CHEMISTRY LABORATORY**

| Prerequisite | Program Name                                                | Sem | Category | L | T | P | C |
|--------------|-------------------------------------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E./B.TECH. Common to CIVIL, CSE, EEE, MECH, IT, and AI&DS | I   | BSC      | 0 | 0 | 4 | 2 |

**II - Course Objectives (Physics Laboratory)**

|    |                                                                                          |
|----|------------------------------------------------------------------------------------------|
| 1. | To learn the correct usage of several types of physics lab equipment.                    |
| 2. | To learn, how to gather, present, and understand facts in a simple and succinct manner.  |
| 3. | To learn Physics-related problem-solving abilities and experimental data interpretation. |
| 4. | To identify experimental measurement error and the methods used to reduce it             |
| 5. | To encourage active participation from the learner in all aspects of the lab exercises.  |

**III - Course Content****Preamble:**

This course aims to provide practical training in the estimation of physical parameters like band gap, ultrasound velocity, liquid compressibility, thin wire thickness, Young's modulus, and knowledge of the operation of the photoelectric effect, Michelson interferometer, laser, and fibre optics as well as to provide project-based skills development.

**PHYSICS LABORATORY: (Any seven experiments to be conducted)**

1. Torsional pendulum – Determination of rigidity modulus of wire and moment of inertia of disc.
2. Uniform bending (or) Non-uniform Bending– Determination of young's modulus.
3. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.
4. Laser- Determination of the wave length of the laser using grating.
5. (a) Optical fibre -Determination of Numerical Aperture and acceptance angle  
(b) Compact disc- Determination of width of the groove using laser.
6. Air wedge – Determination of thickness of a thin sheet/wire.
7. Determination of Band gap of a semiconductor.
8. Particle size determination using LASER.
9. Simple harmonic oscillations of cantilever.
10. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde's string experiment
14. Experiment with lattice dynamics kit.



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## IV - Course Outcomes (Physics Laboratory)

| On completion of the course, the students will be able to |                                                                                                                                                            | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Apprehend the concepts of interference, diffraction of light and recognize the resonance concept of waves.                                                 | Understand (K2)      |
| CO2                                                       | Apply the principles of operations of optical fibers, semiconductor using simple circuits and interaction of electromagnetic waves and crystalline solids. | Apply (K3)           |
| CO3                                                       | Measure the elastic moduli and moment of inertia of given materials with the help of suggested procedures.                                                 | Apply (K3)           |
| CO4                                                       | Experiment the relationship between the light and matter & properties of liquids.                                                                          | Analyze (K4)         |
| CO5                                                       | Estimate the velocity of sound and compressibility of liquid.                                                                                              | Understand (K2)      |

## V - Course Objectives (Chemistry Laboratory)

|    |                                                                                                                                                            |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper. |
| 2. | To induce the students to familiarize with electroanalytical techniques such as, pH metry and potentiometry                                                |
| 3. | To make the student to acquire practical skills conductometry in the determination of impurities in aqueous solutions.                                     |
| 4. | To demonstrate the analysis of metals and alloys.                                                                                                          |
| 5. | To demonstrate the synthesis of nanoparticles                                                                                                              |

## VI - Course Content

**Preamble:**

This course aims to provide the students, a basic practical knowledge in chemistry. The objective of this course is to develop intellectual and psychomotor skills of the students by providing hands on experience in quantitative, electrochemical and photo-chemical analysis.

**CHEMISTRY LABORATORY: (Any seven experiments to be conducted)**

1. Estimation of HCl using  $\text{Na}_2\text{CO}_3$  as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer.
10. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
11. Pseudo first order kinetics-ester hydrolysis.
12. Corrosion experiment-weight loss method.
13. Phase change in a solid.
14. Conductometric titration of strong acid vs strong base.

|                            |                                                                            |
|----------------------------|----------------------------------------------------------------------------|
| <b>Reference Books:</b>    | 1. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014). |
| <b>MOOC/Web Platforms:</b> | -                                                                          |

**VII - Course Outcomes (Chemistry Laboratory)**

| On completion of the course, the students will be able to |                                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO. | Analyze (K4)         |
| <b>CO2</b>                                                | Determine the amount of metal ions through volumetric and spectroscopic techniques.              | Apply (K3)           |
| <b>CO3</b>                                                | Analyse and determine the composition of alloys.                                                 | Analyze (K4)         |
| <b>CO4</b>                                                | Learn simple method of synthesis of nanoparticles                                                | Understand (K2)      |
| <b>CO5</b>                                                | Quantitatively analyse the impurities in solution by electroanalytical methods.                  | Analyze (K4)         |

**VIII - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 1   | -   | -   | -   | -   | -   | 1   | 3   | 2    | -    | -    | -    | -    | -    |
| <b>CO2</b>  | 3   | 1   | -   | -   | -   | -   | -   | 1   | 2   | 1    | -    | -    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | -   | -   | -   | -   | -   | 2   | 2   | 1    | -    | -    | -    | -    | -    |
| <b>CO4</b>  | 3   | 2   | -   | -   | -   | -   | -   | 1   | 3   | 2    | -    | -    | -    | -    | -    |
| <b>CO5</b>  | 3   | 2   | -   | -   | -   | -   | -   | 2   | 1   | 2    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

**I - Course Name: 23GE112 ENGLISH LABORATORY - I**

| Prerequisite | Program Name                        | Sem | Category | L | T | P | C |
|--------------|-------------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E./B.TECH. Common to All Branches | I   | EEC      | 0 | 0 | 2 | 1 |

**II - Course Objectives**

|    |                                                                                                                                                                |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To improve the communicative competence of learners                                                                                                            |
| 2. | To help learners use language effectively in academic /work contexts                                                                                           |
| 3. | To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.                                 |
| 4. | To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts. |
| 5. | To use language efficiently in expressing their opinions via various media.                                                                                    |

**III - Course Content****Preamble:**

This course is designed to equip students with the necessary skills to listen and speak so as to develop their linguistic and communicative competencies.

| Unit - I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION | 6 Periods |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------|
| Listening for general information-specific details- conversation: Introduction to classmates - Audio /video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; -politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions (filling out a bank application for example). |                                               |           |
| Unit - II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NARRATION AND SUMMATION                       | 6 Periods |
| Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities- Note Taking. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations - describing experiences and feelings- engaging in small talk- describing requirements and abilities.                                                                                                                  |                                               |           |
| Unit - III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | DESCRIPTION OF A PROCESS / PRODUCT            | 6 Periods |
| Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking - Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities (large & small)-talking about precautions.                                                                                                       |                                               |           |
| Unit - IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CLASSIFICATION AND RECOMMENDATIONS            | 6 Periods |
| Listening - Listening to TED Talks; Listening to lectures - and educational videos. Speaking - Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation.                                                                                                                                                                                            |                                               |           |
| Unit - V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | EXPRESSION                                    | 6 Periods |
| Listening - Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking - making predictions - talking about a given topic-giving opinions- understanding a website- describing processes.                                                                                                                                                                                                                                                               |                                               |           |

**TOTAL: 30 Periods**



|                              |                                                                                                                     |
|------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Recommended Software:</b> | [1] Globarena Software                                                                                              |
|                              | [2] Open-Source Software and YouTube Videos in Career Lab.                                                          |
| <b>Manual</b>                | [1] English Laboratory Manual, Department of English, NPR College of Engineering & Technology College, Dindigul.    |
| <b>MOOC/Web Platforms:</b>   | <a href="https://www.digitalteacher.in/english-language-lab">https://www.digitalteacher.in/english-language-lab</a> |

## IV – Course Outcomes

| On completion of the course, the students will be able to |                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | To listen to and comprehend general as well as complex academic information.                   | Understand (K2)      |
| CO2                                                       | To listen to and understand different points of view in a discussion.                          | Understand (K2)      |
| CO3                                                       | To speak fluently and accurately in formal and informal communicative contexts.                | Apply (K3)           |
| CO4                                                       | To describe products and processes and explain their uses and purposes clearly and accurately. | Create (K6)          |
| CO5                                                       | To express their opinions effectively in both formal and informal discussions.                 | Create (K6)          |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO2         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO3         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO4         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO5         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23HS201 PROFESSIONAL ENGLISH - II**

| Prerequisite             | Program Name                          | Sem | Category | L | T | P | C |
|--------------------------|---------------------------------------|-----|----------|---|---|---|---|
| Professional English - I | B.E./B.TECH. - Common to All Branches | II  | HSMC     | 2 | 0 | 0 | 2 |

**II - Course Objectives**

|    |                                                                                                   |
|----|---------------------------------------------------------------------------------------------------|
| 1. | To engage learners in meaningful language activities to improve their reading and writing skills. |
| 2. | To learn various reading strategies and apply in comprehending documents in professional context. |
| 3. | To help learners understand the purpose, audience, contexts of different types of writing.        |
| 4. | To develop analytical thinking skills for problem solving in communicative contexts.              |
| 5. | To demonstrate an understanding of job applications and interviews for internship and placements. |

**III - Course Content****Preamble:**

This course is designed to impart required levels of Communication Skills in Reading and Writing and Proficiency in English language in writing necessary for different professional contexts.

|                                                                                                                                                                                                                                                                                 |                                              |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                 | <b>MAKING COMPARISONS</b>                    | <b>6 Periods</b> |
| Reading - Reading advertisements, user manuals, brochures; - Discourse markers (connectives & sequence words), Writing — Compare and Contrast Essay; Grammar – Active & Passive Voice- Impersonal Passive Voice.                                                                |                                              |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                | <b>EXPRESSING CAUSAL RELATIONS</b>           | <b>6 Periods</b> |
| Reading - Reading longer technical texts– Cause and Effect Essays, and Formal Letters / emails of complaint, Writing - Writing responses to complaints – Jumbled sentences. Grammar - Infinitive and Gerunds.                                                                   |                                              |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                               | <b>CRITICAL THINKING AND PROBLEM SOLVING</b> | <b>6 Periods</b> |
| Reading - Case Studies, excerpts from literary texts, news reports etc. Writing – Letter to the Editor, Checklists, Drafting of Circulars, Agenda & Minutes of the meeting, Problem solution essay / Argumentative Essay. Grammar – Error correction; If conditional sentences. |                                              |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                | <b>REPORTING OF EVENTS</b>                   | <b>6 Periods</b> |
| Reading –Newspaper articles; Writing – Accident Report with Recommendations, Survey Report; Grammar – Reported Speech, Modals – Conjunctions- Sentence pattern                                                                                                                  |                                              |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                 | <b>COHESIVE WRITING</b>                      | <b>6 Periods</b> |
| Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses.                                                          |                                              |                  |

**TOTAL: 30 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                     |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | [1] English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.                                      |
|                            | [2] English for Science & Technology Cambridge University Press 2021.                                                                                               |
|                            | [3] Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN.Shoba, and Dr. Lourdes Joevani, Department of English, Anna University. |
| <b>Reference Books:</b>    | [1] Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw-Hill India, 2017.                                                                        |
|                            | [2] Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.                                                            |
|                            | [3] Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.                                                                     |
|                            | [4] Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003.                                                                                |
|                            | [5] Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, TataMcGraw Hill & Co. Ltd., 2001, New Delhi.                                   |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc23_hs115/preview">https://onlinecourses.nptel.ac.in/noc23_hs115/preview</a>                                           |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                       | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | To compare and contrast products and ideas in technical texts and write analytical essays.                                            | Apply (K2)           |
| CO2                                                       | To identify and report cause and effects in events, industrial processes through technical texts and draft a report with suggestions. | Create (K6)          |
| CO3                                                       | To analyze problems in order to arrive at feasible solutions and communicate them in the written format.                              | Analyze (K4)         |
| CO4                                                       | To present their ideas and opinions in a planned and logical manner in industrial nature.                                             | Create (K6)          |
| CO5                                                       | To draft effective resumes in the context of job application.                                                                         | Create (K6)          |

  
 Chairperson Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO2         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO3         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO4         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO5         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

## I - Course Name: 23MA901 - PROBABILITY AND STATISTICS

| Prerequisite | Program Name                              | Sem      | Category | L | T | P | C |
|--------------|-------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B. E / B. TECH. - Common to CSE, IT & EEE | II / III | BSC      | 3 | 1 | 0 | 4 |

## II - Course Objectives

|    |                                                                                                                                                                                       |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To provide necessary basic concepts in probability.                                                                                                                                   |
| 2. | To understand the basic concepts of one - dimensional random variable and to introduce some standard distributions applicable to engineering which can describe real life phenomenon. |
| 3. | To understand the basic concepts of two - dimensional random variables.                                                                                                               |
| 4. | To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.                                                   |
| 5. | Apply the basic concepts of classifications of design of experiments in the field of agriculture.                                                                                     |

## III - Course Content

## Preamble:

This course is enabled to apply drawn inferences to difference machine learning models, exposing to data clustering, data classification, data validation and data fitting.

|                                                                                                                                                                                                                                        |                                         |                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                        | <b>PROBABILITY AND RANDOM VARIABLES</b> | <b>12 Periods</b> |
| Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Mean and variance of random variables - Moments – Moment generating functions.                                           |                                         |                   |
| <b>Unit – II</b>                                                                                                                                                                                                                       | <b>PROBABILITY DISTRIBUTIONS</b>        | <b>12 Periods</b> |
| Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions – Transformation of a random variable.                                                                                                                     |                                         |                   |
| <b>Unit – III</b>                                                                                                                                                                                                                      | <b>TWO DIMENSIONAL RANDOM VARIABLES</b> | <b>12 Periods</b> |
| Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of two random variables.                                                                                |                                         |                   |
| <b>Unit – IV</b>                                                                                                                                                                                                                       | <b>TESTING OF HYPOTHESIS</b>            | <b>12 Periods</b> |
| Statistical hypothesis –small samples Tests based on t-test, F-test– Chi square test for goodness of fit – Independence of attributes - Large sample tests based on Normal distribution for mean and difference of means - proportion. |                                         |                   |
| <b>Unit – V</b>                                                                                                                                                                                                                        | <b>DESIGN OF EXPERIMENTS</b>            | <b>12 Periods</b> |
| Analysis of variance - One way and two way classifications: Completely randomized design – Randomized block design – Latin square design.                                                                                              |                                         |                   |

TOTAL: 60 Periods

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b> | <p>[1] Johnson. R.A., Miller. I and Freund. J., "Miller and Freunds Probability and Statistics for Engineers", Pearson Education, Asia, 9<sup>th</sup> Edition, 2016.</p> <p>[2] Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4<sup>th</sup> Edition, 2007.</p> <p>[3] Grewal.B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44<sup>th</sup> Edition, 2018.</p> |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b>    | <p>[1] Devore. J.L., "Probability and Statistics for Engineering and the Sciences, Cengage Learning, New Delhi, 8<sup>th</sup> Edition, 2014.</p> <p>[2] Papoulis. A. and Unnikrishnapillai . S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4<sup>th</sup> Edition, New Delhi, 2010.</p> <p>[3] Ross . S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5<sup>th</sup> Edition, Elsevier, 2014.</p> <p>[4] Spiegel. M.R., Schiller. J. and Srinivasan . R.A., "Schaums Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 4<sup>th</sup> Edition, 2012.</p> <p>[5] Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9<sup>th</sup> Edition, 2010.</p> |
| <b>MOOC/Web Platforms:</b> | <p><a href="https://onlinestatbook.com/2/probability/basic.html">https://onlinestatbook.com/2/probability/basic.html</a></p> <p><a href="https://www.youtube.com/watch?v=b5VUnapu-qs">https://www.youtube.com/watch?v=b5VUnapu-qs</a></p> <p><a href="https://www.youtube.com/watch?v=q01b-IV6y5Q">https://www.youtube.com/watch?v=q01b-IV6y5Q</a></p> <p><a href="https://webspace.maths.qmul.ac.uk/b.bogacka/MS_NotesWeek4.pdf">https://webspace.maths.qmul.ac.uk/b.bogacka/MS_NotesWeek4.pdf</a></p>                                                                                                                                                                                                                                                                                                                                                         |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | To Understand the fundamental concepts of probability.                                                                           | Understand (K2)      |
| CO2                                                       | By applying the knowledge of one-dimensional random variables to standard distributions which can describe real life phenomenon. | Apply (K3)           |
| CO3                                                       | Understand the basic concepts of two-dimensional random variables and apply in engineering applications.                         | Understand (K2)      |
| CO4                                                       | Apply the concept of testing of hypothesis for small and large samples in real life problems.                                    | Apply (K3)           |
| CO5                                                       | Apply the basic concepts of classifications of design of experiments in the field of agriculture.                                | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | -   | -   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO2         | 3   | 3   | -   | -   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO3         | 3   | 3   | -   | -   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO4         | 3   | 3   | 1   | 1   | 1   | -   | -   | -   | 2   | -    | 2    | 3    | -    | -    | -    |
| CO5         | 3   | 3   | 1   | 1   | 1   | -   | -   | -   | 2   | -    | 2    | 3    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



Chairperson-Board of Studies,  
Department of Information Technology  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## I - Course Name: 23PH203 - PHYSICS FOR INFORMATION SCIENCE

| Prerequisite        | Program Name                               | Sem | Category | L | T | P | C |
|---------------------|--------------------------------------------|-----|----------|---|---|---|---|
| Engineering Physics | B.E. /B.TECH. Common to CSE, IT, and AI&DS | II  | BSC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|    |                                                                                                                  |
|----|------------------------------------------------------------------------------------------------------------------|
| 1. | To understanding the fundamental physics of conducting materials, superconductors, and material characteristics. |
| 2. | To impart fundamental knowledge of semiconductor device and electron transport characteristics.                  |
| 3. | To get expertise in magnetic materials.                                                                          |
| 4. | To know how superconducting materials with null resistance and optical materials for optoelectronics work.       |
| 5. | To learn how nano electronic devices operate on a fundamental level.                                             |

## III - Course Content

**Preamble:**

Students who complete this course will have a broader understanding of conducting, semiconducting, magnetic, superconducting, optical, and nanomaterials as well as an understanding of how different fields of knowledge are interconnected.

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CONDUCTING MATERIALS                  | 9 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------|
| Classical free electron theory - electrical and thermal conductivity expression - Wiedemann-Franz law - electrons in metals - motion of a particle in a three-dimensional box - Fermi- Dirac statistics - density of energy states - electron in periodic potential - Kronig-Penney Model (Qualitative) - energy bands in solids - Zone theory - electron effective mass.                                                                                                                       |                                       |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SEMICONDUCTING MATERIALS              | 9 Periods |
| Intrinsic semiconductors - direct and indirect band gap semiconductors - carrier concentration in intrinsic semiconductors - extrinsic semiconductors - carrier concentration in N-type & P-type semiconductors - variation of carrier concentration with temperature - variation of fermi level with temperature and impurity concentration - carrier transport in Semiconductor: random motion, drift, mobility and diffusion - Hall effect and experiment - Ohmic contacts - Schottky diode. |                                       |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MAGNETIC MATERIALS                    | 9 Periods |
| Magnetic dipole moment - atomic magnetic moments - magnetic permeability and susceptibility - magnetic material classification: diamagnetism - paramagnetism - ferromagnetism - antiferromagnetism - ferrimagnetism - ferromagnetism: origin and exchange interaction - domain theory - M versus H behavior - hard and soft magnetic materials - applications - magnetic principle in computer data storage - magnetic hard disc - GMR sensor.                                                  |                                       |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SUPERCONDUCTING AND OPTICAL MATERIALS | 9 Periods |
| Super conductivity - type-I and type-II superconductors - properties and applications - classification of optical materials - carrier generation and recombination processes - photo current in a P-N diode - solar cell - LED - Organic LED - optical data storage techniques and devices.                                                                                                                                                                                                     |                                       |           |

| Unit – V                                                                                                                                                                                                                                                                                                        | NANO DEVICES | 9 Periods |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|
| Introduction - size dependence of fermi energy - quantum structures - density of states in quantum well, quantum wire and quantum dot structure - band gap of nanomaterials - tunneling: single electron phenomena and single electron transistor - carbon nanotubes: preparation, properties and applications. |              |           |

TOTAL: 45 Periods

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Books for study &amp; Reference:</b> | [1] S.O.Pillai, "Solid State Physics, New Academic Science", 2017.<br>[2] V.Raghavan. Materials Science and Engineering: A First Course, Prentice Hall India Learning Private Limited, 2015.<br>[3] A. Marikani, Materials Science, PHI Learning Pvt Ltd, 2017<br>[4] D.K.Bhattacharya&PoonamTandon., "Physics for Information Science and Electronics Engineering", Oxford Higher Education", 2017.<br>Rogers, B., Adams, J. &Pennathur, S., "Nanotechnology: Understanding Small Systems", CRC Press, 2014.                                                                                                                                                                                                                                                                           |
| <b>MOOC/Web Platforms:</b>              | <a href="https://onlinecourses.nptel.ac.in/noc20_ph10/preview">https://onlinecourses.nptel.ac.in/noc20_ph10/preview</a><br><a href="https://www.electronics-notes.com/articles/basic_concepts/conductors-semiconductors-insulators/semiconductor-materials-types-groups.php">https://www.electronics-notes.com/articles/basic_concepts/conductors-semiconductors-insulators/semiconductor-materials-types-groups.php</a><br><a href="https://advancedmagnetsource.com/types-magnetic-materials/">https://advancedmagnetsource.com/types-magnetic-materials/</a><br><a href="https://nptel.ac.in/courses/115103108">https://nptel.ac.in/courses/115103108</a><br><a href="https://onlinecourses.nptel.ac.in/noc22_ee47/preview">https://onlinecourses.nptel.ac.in/noc22_ee47/preview</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | To recognize the fundamental ideas behind different free-electron theories and establish the solids' electrical characteristics. | Understand (K2)      |
| CO2                                                       | To evaluate the functions of semiconductors and their uses.                                                                      | Apply (K3)           |
| CO3                                                       | To employing quantum principles to examine the mechanisms at work in magnetic materials.                                         | Apply (K3)           |
| CO4                                                       | To understand about the uses of superconducting and Optical properties of materials.                                             | Understand (K2)      |
| CO5                                                       | To show the fundamentals of how micro- and nano-electronic equipment functions.                                                  | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1     | 3   | 3   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO2     | 3   | 3   | -   | 3   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO3     | 3   | 3   | -   | 3   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO4     | 3   | 3   | 3   | -   | 2   | -   | -   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO5     | 3   | 3   | 3   | -   | 3   | 1   | 1   | -   | -   | -    | -    | 3    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

**I - Course Name: 23BE201 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

| Prerequisite          | Program Name                               | Sem | Category | L | T | P | C |
|-----------------------|--------------------------------------------|-----|----------|---|---|---|---|
| Engineering Physics I | B.E. /B.TECH. Common to CSE, IT, and AI&DS | II  | ESC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|    |                                                                                                |
|----|------------------------------------------------------------------------------------------------|
| 1. | To introduce the basics of electric circuits and analysis                                      |
| 2. | To impart knowledge in the basics of working principles and application of electrical Machines |
| 3. | To introduce analog devices and their characteristics                                          |
| 4. | To educate on the fundamental concepts of digital electronics                                  |
| 5. | To introduce the functional elements and working of measuring instruments                      |

**III - Course Content****Preamble:**

It is an introductory course which emphasizes the fundamental concepts and overview of Electrical Engineering. The concepts discussed herein are intended to provide clarification on basic electrical engineering for beginners of all engineering graduates.

| Unit - I                                                                                                                                                                                                                                                                                                                                                                                                                           | ELECTRICAL CIRCUITS                        | 9 Periods |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------|
| DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor (Simple problems only) |                                            |           |
| Unit - II                                                                                                                                                                                                                                                                                                                                                                                                                          | ELECTRICAL MACHINES (Qualitative Analysis) | 9 Periods |
| Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, working principle and Applications of Transformer, Single phase Induction Motor, Working types and Applications                                                                                                        |                                            |           |
| Unit - III                                                                                                                                                                                                                                                                                                                                                                                                                         | ANALOG ELECTRONICS (Qualitative Analysis)  | 9 Periods |
| Semiconductor Materials: Silicon & Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing (CB Characteristics only) JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications                                                                                                                                                                                 |                                            |           |
| Unit - IV                                                                                                                                                                                                                                                                                                                                                                                                                          | DIGITAL ELECTRONICS                        | 9 Periods |
| Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only).                                                                                                                                                                                                 |                                            |           |
| Unit - V                                                                                                                                                                                                                                                                                                                                                                                                                           | MEASUREMENTS AND INSTRUMENTATION           | 9 Periods |
| Functional elements of an instrument, Standards and calibration, Operating Principle, types -Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, DSO- Block diagram- Data acquisition.                                                                                                                                                                                                             |                                            |           |



|                            |                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | [1] Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020<br>[2] S.K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.                                                                         |
| <b>Reference Books:</b>    | [1] Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.<br>[2] Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017<br>[3] H.S. Kalsi, 'Electronic Instrumentation and Measurements', Tata McGraw-Hill, New Delhi, 2019 |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.classcentral.com/course/swayam-fundamentals-of-electrical-engineering-14074">https://www.classcentral.com/course/swayam-fundamentals-of-electrical-engineering-14074</a>                                                                                                                         |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                      | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Compute the electric circuit parameters for simple problems                          | Apply (K3)           |
| <b>CO2</b>                                                | Examine the working principle and applications of electrical machines                | Understand (K2)      |
| <b>CO3</b>                                                | Illustrate the characteristics of analog electronic devices                          | Understand (K2)      |
| <b>CO4</b>                                                | Examine the basic concepts of digital electronics                                    | Analyze (K4)         |
| <b>CO5</b>                                                | Apply the concepts of principles of measuring instruments for real time applications | Apply (K2)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 2   | 2   | 1   | -   | -   | -   | 1   | -   | -   | -    | 2    | 2    | -    | -    | -    |
| <b>CO2</b>  | 2   | 2   | 1   | -   | -   | -   | 1   | -   | -   | -    | 2    | 2    | -    | -    | -    |
| <b>CO3</b>  | 2   | 1   | 1   | -   | -   | -   | 1   | -   | -   | -    | 2    | 2    | -    | -    | -    |
| <b>CO4</b>  | 2   | 2   | 1   | -   | -   | -   | 1   | -   | -   | -    | 2    | 2    | -    | -    | -    |
| <b>CO5</b>  | 2   | 2   | 1   | -   | -   | -   | 1   | -   | -   | -    | 2    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



**I - Course Name: 23GE901 - ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**

| Prerequisite | Program Name                                     | Sem     | Category | L | T | P | C |
|--------------|--------------------------------------------------|---------|----------|---|---|---|---|
| Nil          | B.E. /B.TECH. - Common to CSE, ECE, AI&DS and IT | II / IV | BSC      | 2 | 0 | 0 | 2 |

**II - Course Objectives**

|    |                                                                                                                                                                           |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on biodiversity of India and its conservation.                                  |
| 2. | To impart knowledge on the causes, effects and control or prevention measures of environmental pollution.                                                                 |
| 3. | To study the dynamic processes and understand the features of the earth's interior and surface.                                                                           |
| 4. | To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.         |
| 5. | To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization. |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                          |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------|
| <b>Preamble:</b><br>The objective of this course is intended to make the students to understand the basic concepts of environment, ecology and pollution of the current environmental issues and to participate in various activities on conserving and protecting the environment.                                                                                                                                                                                         |                                          |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>ENVIRONMENT AND BIODIVERSITY</b>      | <b>6 Periods</b> |
| Definition, scope and importance of environment – need for public awareness. Eco-system and energy flow – ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: in-situ and ex-situ. |                                          |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>ENVIRONMENTAL POLLUTION</b>           | <b>6 Periods</b> |
| Causes, effects and preventive measures of water, soil, air and noise pollutions. Solid, hazardous and e-waste management. case studies on occupational health and safety management system (OHASMS). Environmental protection - environmental protection acts.                                                                                                                                                                                                             |                                          |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>SOCIAL ISSUES AND THE ENVIRONMENT</b> | <b>6 Periods</b> |
| Water conservation, rain water harvesting, watershed management – Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.                                                                                                                                                                                                                                                          |                                          |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>RENEWABLE SOURCES OF ENERGY</b>       | <b>6 Periods</b> |
| Energy management and conservation, new energy sources: need of new sources. Different types new energy sources. Applications of - hydrogen energy, ocean energy resources, tidal energy conversion. Concept, origin and power plants of geothermal energy.                                                                                                                                                                                                                 |                                          |                  |

| Unit - V                                                                                                                                                                                                                                                                                                                                                                                                                        | SUSTAINABILITY PRACTICES | 6 Periods |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------|
| Zero waste and R concept, circular economy, ISO 14000 series, material life cycle assessment, environmental impact assessment. Sustainable habitat: green buildings, green materials, energy efficiency, Sustainable transports. Sustainable energy: non-conventional sources, energy cycles carbon cycle, emission and sequestration, green engineering: sustainable urbanization - socio economical and technological change. |                          |           |

**TOTAL: 30 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Anubha Kaushik and C. P. Kaushik's 'Perspectives in Environmental Studies', 6<sup>th</sup> Edition, New Age International Publishers, 2018.</li> <li>2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2017.</li> <li>3. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2<sup>nd</sup> edition, Pearson Education, 2004.</li> <li>4. Allen, D. T. and Shonnard, D. R., 'Sustainability Engineering: Concepts, Design and Case Studies', Prentice Hall.</li> <li>5. Bradley. A.S; Adebayo, A.O., Maria, P. 'Engineering applications in sustainable design and development', Cengage learning.</li> <li>6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.</li> </ol> |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media, 2010.</li> <li>2. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.</li> <li>3. Erach Bharucha 'Textbook of Environmental Studies for Under graduate Courses' Orient Blackswan Pvt. Ltd. 2021.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/">https://onlinecourses.nptel.ac.in/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                                                                      | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation                                                         | Remember (K1)        |
| CO2                                                       | To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.                           | Understand (K2)      |
| CO3                                                       | Identify the causes, effects of natural disasters and contribute to the preventive measures in the society.                                                          | Apply (K3)           |
| CO4                                                       | To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations. | Understand (K2)      |
| CO5                                                       | To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.                       | Apply (K3)           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 1   | -   | -   | -   | 2   | 3   | -   | 1   | -    | -    | 2    | -    | -    | -    |
| CO2         | 3   | 2   | -   | -   | -   | 3   | 3   | -   | 1   | -    | -    | 2    | -    | -    | -    |
| CO3         | 3   | 1   | 1   | -   | -   | 2   | 2   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO4         | 3   | 1   | 1   | 1   | -   | 2   | 2   | -   | 1   | -    | -    | 2    | -    | -    | -    |
| CO5         | 3   | 2   | 1   | -   | -   | 2   | 2   | -   | 1   | -    | -    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23CS201 - PYTHON PROGRAMMING

| Prerequisite                              | Program Name                           | Sem | Category | L | T | P | C |
|-------------------------------------------|----------------------------------------|-----|----------|---|---|---|---|
| 23GE101-Problem Solving and C Programming | B.E/ B.Tech. – Common to CSE, IT & ECE | II  | PCC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                             |
|---|-----------------------------------------------------------------------------------------------------------------------------|
| 1 | To guide students in problem-solving using Python conditionals and loops effectively.                                       |
| 2 | To guide students in problem-solving using Python conditionals and loops effectively.                                       |
| 3 | To enable students to utilize Python data structures such as lists, tuples, and dictionaries for representing complex data. |
| 4 | To assist students in performing input/output operations with files in Python.                                              |
| 5 | To support students in using Python exceptions and libraries proficiently.                                                  |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                            |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------|
| <b>Preamble:</b> Python is an open-sourced programming language that combines the features of C and Java. It has exceptional procedural as well as object-oriented capabilities. Having said this, always remember that everything in Python is an <b>object</b> .                                                                                                                                                                                                                                        |                                            |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>DATA TYPES, EXPRESSIONS, STATEMENTS</b> | <b>9 Periods</b> |
| Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.                                                                                                                                                                      |                                            |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>CONTROL FLOW, FUNCTIONS, STRINGS</b>    | <b>9 Periods</b> |
| Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search. |                                            |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>LISTS, TUPLES, DICTIONARIES</b>         | <b>9 Periods</b> |
| Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.                                                                                                                                            |                                            |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>FILES, MODULES, PACKAGES</b>            | <b>9 Periods</b> |
| Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).                                                                                                                                                                                                                                |                                            |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>EXCEPTIONS, LIBRARIES</b>               | <b>9 Periods</b> |
| Exception Handling – Built-in Exceptions – Application Development with Python: Integrated Development Environment, Python Standard Library                                                                                                                                                                                                                                                                                                                                                               |                                            |                  |

TOTAL: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.</li> <li>2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning &amp; Development Limited, 2017.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.</li> <li>2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.</li> <li>3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021</li> <li>4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.</li> <li>5. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.w3schools.com/">Introduction to C (w3schools.com)</a><br><a href="https://www.python.org/">https://www.python.org/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain the concepts of python data types, expressions and statements                                                          | Understand (K2)      |
| CO2                                                       | Make use of Python programs for solving real-time computational Problems by using conditionals, looping, functions and strings | Apply (K3)           |
| CO3                                                       | Explain the concepts of compound data using Python lists, tuples and dictionaries                                              | Understand (K2)      |
| CO4                                                       | Develop the python programs for solving computational Problems by using modules, files and python packages                     | Apply (K3)           |
| CO5                                                       | Develop the python programs for solving computational Problems by using Exceptions and Libraries                               | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs / POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|-----------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| CO1       | 3    | 2    | 2    | 2    | 2    | -    | -    | -    | -    | 2    | 2    | 2    | 2     | 3     | 3     |
| CO2       | 3    | 3    | 3    | 2    | 2    | -    | -    | -    | -    | 2    | 2    | 2    | 2     | 3     | 3     |
| CO3       | 3    | 3    | 3    | 2    | 2    | -    | -    | -    | -    | 2    | 3    | 2    | 2     | 3     | 3     |
| CO4       | 3    | 2    | 2    | 2    | 2    | -    | -    | -    | -    | 2    | 2    | 2    | 2     | 3     | 3     |
| CO5       | 3    | 3    | 3    | 2    | 2    | -    | -    | -    | -    | 2    | 2    | 2    | 2     | 3     | 3     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23GE201- தமிழரும் தொழில்நுட்பமும் / Tamils and Technology

| Prerequisite | Program Name                        | Sem | Category | L | T | P | C |
|--------------|-------------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E./B.TECH. Common to All Branches | II  | HSMC     | 1 | 0 | 0 | 1 |

## II - Course Content

| Unit - I                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | WEAVING AND CERAMIC TECHNOLOGY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |
| Unit - II                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | DESIGN AND CONSTRUCTION TECHNOLOGY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3 Periods |
| Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Marnallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |
| Unit - III                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MANUFACTURING TECHNOLOGY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3 Periods |
| Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and goldCoins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |
| Unit - IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | AGRICULTURE AND IRRIGATION TECHNOLOGY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3 Periods |
| Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |
| Unit - V                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SCIENTIFIC TAMIL & TAMIL COMPUTING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3 Periods |
| Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |
| <b>TOTAL: 15 Periods</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |
| <b>Text Books:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | [1] தமிழக வரலாறு மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு- தமிழ்நாடுபாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).<br>[2] கணினித்தமிழ் முனைவர் இலசந்தரம் (விகடன்பிரசுரம்).<br>[3] கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).<br>[4] பொருளை-ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு).<br>[5] Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)<br>[6] Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).                                                                                                                                                                                                                                                                                                             |           |
| <b>Reference Books:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | [1] Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).<br>[2] The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)<br>[3] Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)<br>[4] Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)<br>[5] Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)<br>[6] Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book. |           |

Board of Studies,

Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## I – Course Code &amp; Name: 23GE211 - ENGINEERING PRACTICES LABORATORY

| Prerequisite | Program Name                          | Sem | Category | L | T | P | C   |
|--------------|---------------------------------------|-----|----------|---|---|---|-----|
| Nil          | B.E./B.TECH. – Common to All Branches | II  | ESC      | 0 | 0 | 3 | 1.5 |

## II - Course Objectives

|    |                                                                                                                                                                                                                                                                           |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.                                                                          |
| 2. | Wiring various electrical joints in common household electrical wire work.                                                                                                                                                                                                |
| 3. | Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipment; Making a tray out of metal sheet using sheet metal work. |
| 4. | Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.                                                                                                                                                             |

## III - Course Content

## Preamble:

Engineering Practices Laboratory – a hands-on learning experience that complements your theoretical knowledge with practical skills essential for success in the field of engineering. This laboratory course is designed to bridge the gap between classroom learning and real-world application, providing a platform to develop crucial engineering skills and gain confidence in working with tools, equipment, and techniques commonly used in engineering practice.

## GROUP – A (CIVIL &amp; MECHANICAL)

| PART 1 | CIVIL ENGINEERING PRACTICES PLUMBING WORK | 12 Periods |
|--------|-------------------------------------------|------------|
|--------|-------------------------------------------|------------|

## PLUMBING WORK:

- Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows, and other components which are commonly used in households.
- Preparing plumbing line sketches.
- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Connecting pipes of different materials: Metal, plastic, and flexible pipes used in household appliances.

## WOOD WORK:

- Sawing,
- Planing and
- Making joints like T-Joint, Mortise joint and Tenon joint, and Dovetail joint.

## Wood Work Study:

- Studying joints in door panels and wooden furniture.
- Studying common industrial trusses using models.

| PART 2 | MECHANICAL ENGINEERING PRACTICES | 12 Periods |
|--------|----------------------------------|------------|
|--------|----------------------------------|------------|

## WELDING WORK:

- Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
- Practicing gas welding.

## BASIC MACHINING WORK:

- (Simple) Turning.
- (Simple) Drilling.
- (Simple) Tapping.

## ASSEMBLY WORK:

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                         |                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------|
| a) Assembling a centrifugal pump.<br>b) Assembling a household mixer.<br>c) Assembling an air conditioner.<br>SHEET METAL WORK:<br>a) Making of a square tray                                                                                                                                                                                                                                                                                                                 |                                         |                   |
| <b>GROUP – B (ELECTRICAL AND ELECTRONICS)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                         |                   |
| <b>PART 3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>ELECTRICAL ENGINEERING PRACTICES</b> | <b>11 Periods</b> |
| a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin sockets<br>b) Staircase wiring<br>c) Fluorescent Lamp wiring with introduction to CFL and LED types.<br>d) Energy meter wiring and related calculations/calibration<br>e) Study of Iron Box wiring and assembly<br>f) Study of Fan Regulator (Resistor type and electronic type using Diac/Triac/quadrac)<br>g) Study of emergency lamp wiring/Water heater |                                         |                   |
| <b>PART 4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>ELECTRONIC ENGINEERING PRACTICES</b> | <b>10 Periods</b> |
| SOLDERING WORK:<br>a) Soldering simple electronic circuits and checking continuity.<br>ELECTRONIC ASSEMBLY AND TESTING WORK:<br>a) Assembling and testing electronic components on a small PCB.<br>ELECTRONIC EQUIPMENT STUDY:<br>a) Study an element of smart phone.<br>b) Assembly and dismantle of LED TV.<br>c) Assembly and dismantle of computer/laptop                                                                                                                 |                                         |                   |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                                                                                                                                                                   | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.                                                                                   | Apply (K3)           |
| <b>CO2</b>                                                | Wire various electrical joints in common household electrical wire work.                                                                                                                                                                                          | Apply (K3)           |
| <b>CO3</b>                                                | Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work. | Apply (K3)           |
| <b>CO4</b>                                                | Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.                                                                                                                                                                | Apply (K4)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | -   | -   | 1   | 1   | 1   | -   | -   | -    | -    | 2    | 1    | 1    | -    |
| CO2         | 3   | 2   | -   | -   | 1   | 1   | 1   | -   | -   | -    | -    | 2    | 1    | 1    | -    |
| CO3         | 3   | 2   | -   | -   | 1   | 1   | 1   | -   | -   | -    | -    | 2    | 1    | 1    | -    |
| CO4         | 3   | 2   | -   | -   | 1   | 1   | 1   | -   | -   | -    | -    | 2    | 1    | 1    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23CS211 - PYTHON PROGRAMMING LABORATORY**

| Prerequisite  | Program Name                          | Sem | Category | L | T | P | C   |
|---------------|---------------------------------------|-----|----------|---|---|---|-----|
| C Programming | B.E/B.Tech. – Common to CSE, IT & ECE | II  | PCC      | 0 | 0 | 3 | 1.5 |

**II - Course Objectives**

|   |                                                                                             |
|---|---------------------------------------------------------------------------------------------|
| 1 | To learn the basic programming constructs in Python.                                        |
| 2 | To practice various computing strategies for Python-based solutions to real world problems. |
| 3 | To use Python data structures - lists, tuples, dictionaries.                                |
| 4 | To do input/output with files in Python                                                     |
| 5 | To use python Exceptions and Libraries                                                      |

**III - Course Content**

| LIST OF EXPERIMENTS |                                                                                                                                                                                                     |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                  | Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).                                |
| 2.                  | Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)                                                                                       |
| 3.                  | Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples) |
| 4.                  | Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)             |
| 5.                  | Implementing programs using Functions. (Factorial, largest number in a list, area of shape)                                                                                                         |
| 6.                  | Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)                                                                                                   |
| 7.                  | Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy))                                                                                       |
| 8.                  | Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)                                                                        |
| 9.                  | Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)                                                 |
| 10.                 | Exploring Pygame tool.                                                                                                                                                                              |
| 11.                 | Developing a game activity using Pygame like bouncing ball, car race etc.                                                                                                                           |

**TOTAL: 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Develop simple python programs for applying the concepts of datatypes, expressions, and python statements                 | Understand (K2)      |
| CO2                                                       | Develop Python programs using conditionals, looping, functions, and strings for solving real-time computational problems. | Apply (K3)           |
| CO3                                                       | Understand the concepts of compound data using Python lists, tuples, and dictionaries                                     | Apply (K3)           |
| CO4                                                       | Develop python programs for solving problems by using modules, files, and python packages                                 | Understand (K2)      |
| CO5                                                       | Utilize Python packages for developing real-world software applications                                                   | Apply (K3)           |

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Text Books:         | <ol style="list-style-type: none"> <li>Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.</li> <li>Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning &amp; Development Limited, 2017.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                    |
| Reference Books:    | <ol style="list-style-type: none"> <li>Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.</li> <li>G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.</li> <li>John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021</li> <li>Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.</li> </ol> |
| MOOC/Web Platforms: | <a href="https://www.w3schools.com/">Introduction to Python (w3schools.com)</a><br><a href="https://programiz.com/">Learn Python Programming (programiz.com)</a><br><a href="https://www.python.org/">https://www.python.org/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs / POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|-----------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| CO1       | 3    | 2    | 2    | -    | 2    | -    | -    | 2    | -    | 3    | 2    | 2    | -     | 2     | 3     |
| CO2       | 3    | 3    | 3    | 2    | 2    | -    | -    | 2    | -    | 3    | 2    | 3    | 3     | 2     | 3     |
| CO3       | 3    | 2    | 1    | 2    | -    | -    | -    | 2    | -    | 3    | 2    | 3    | 3     | 2     | 3     |
| CO4       | 3    | 2    | 2    | 2    | 2    | -    | -    | -    | 2    | -    | 2    | 3    | -     | 2     | 3     |
| CO5       | 3    | 3    | 3    | 2    | 2    | -    | -    | -    | 2    | -    | 2    | 3    | 3     | 2     | 3     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

**I - Course Name: 23GE212 - ENGLISH LABORATORY -II**

| Prerequisite           | Program Name                        | Sem | Category | L | T | P | C |
|------------------------|-------------------------------------|-----|----------|---|---|---|---|
| English Laboratory - I | B.E./B.TECH. Common to All Branches | II  | EEC      | 0 | 0 | 2 | 1 |

**II - Course Objectives**

|    |                                                                                                                                       |
|----|---------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.            |
| 2. | To analyze concepts and problems and make effective presentations explaining them clearly and precisely.                              |
| 3. | To enhance the Employability and Career Skills of students and acquire professional skills required for workplace / higher education. |
| 4. | To develop their confidence and help them to attend interviews successfully.                                                          |
| 5. | To make them Employable Graduates and use English language skills effectively in various situations.                                  |

**III - Course Content****Preamble:**

This course is designed to impart necessary skills to listen, speak, read and write in order to obtain better professional communication skills.

|                                                                                                                                                                                                                                                                                                            |                              |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                            | <b>ROLE PLAY</b>             | <b>6 Periods</b> |
| Speaking-Role Play Exercises Based on Workplace Contexts, - talking about competition- discussing progress toward goals-talking about experiences- talking about events in life- discussing past events.                                                                                                   |                              |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                           | <b>TRAVELOGUE</b>            | <b>6 Periods</b> |
| Speaking: Discussing news stories-talking about frequency-talking about travel problems- discussing travel procedures - talking about travel problems- making arrangements-describing arrangements-discussing plans and decisions- discussing purposes and reasons- understanding common technology terms. |                              |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                          | <b>PROFESSIONAL SPEAKING</b> | <b>6 Periods</b> |
| Speaking: Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – Practicing individual presentation— Presenting the visuals effectively (5-minute presentations).                                                                 |                              |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                           | <b>GROUP DISCUSSION</b>      | <b>6 Periods</b> |
| Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic — questioning and clarifying –GD strategies - improving GD skills through activities.                                                                                        |                              |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                            | <b>INTERVIEW</b>             | <b>6 Periods</b> |
| Interview etiquette – dress code – body language – Job interviews through telephone/skype -one to one interview & panel interview – FAQs related to job interviews.                                                                                                                                        |                              |                  |

**TOTAL: 30 Periods**

|                              |                                                                                                                     |
|------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Recommended Software:</b> | [1] Globarena Software.                                                                                             |
|                              | [2] Open-Source Software and YouTube Videos in Career Lab.                                                          |
| <b>Reference Books:</b>      | [1] E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015.               |
|                              | [2] Interact English Lab Manual for Undergraduate Students, OrientBlackSwan: Hyderabad, 2016                        |
|                              | [3] English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw HillEducation, ISBN : 0070264244.     |
|                              | [4] Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House                             |
|                              | [5] Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.                          |
| <b>MOOC/Web Platforms:</b>   | <a href="https://www.digitalteacher.in/english-language-lab">https://www.digitalteacher.in/english-language-lab</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Speak effectively in group discussions held in a formal/semi-formal contexts.                                 | Create (K6)          |
| <b>CO2</b>                                                | Discuss, analyze and present concepts and problems from various perspectives to arrive at suitable solutions. | Analyze (K4)         |
| <b>CO3</b>                                                | Make effective presentations in an attractive way using appropriate vocabulary.                               | Apply (K3)           |
| <b>CO4</b>                                                | Attend job interviews and be successful in them.                                                              | Create (K6)          |
| <b>CO5</b>                                                | Develop adequate Soft Skills required for the workplace.                                                      | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 3    | -    | -    | -    |
| <b>CO2</b>  | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 3    | -    | -    | -    |
| <b>CO3</b>  | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 3    | -    | -    | -    |
| <b>CO4</b>  | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 3    | -    | -    | -    |
| <b>CO5</b>  | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 3    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

## I - Course Name: 23MA302 - DISCRETE MATHEMATICS

| Prerequisites | Program Name                              | Sem | Category | L | T | P | C |
|---------------|-------------------------------------------|-----|----------|---|---|---|---|
| Nil           | B.E/B.Tech. – Common to CSE, IT and AI&DS | III | BSC      | 3 | 1 | 0 | 4 |

## II - Course Objectives

|    |                                                                                                                                        |
|----|----------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To extend student's logical and mathematical maturity and ability to deal with abstraction.                                            |
| 2. | To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.    |
| 3. | To understand the basic concepts of combinatorics and graph theory.                                                                    |
| 4. | To familiarize the applications of algebraic structures.                                                                               |
| 5. | To understand the concepts and significance of lattices and Boolean algebra which are widely used in computer science and engineering. |

## III - Course Content

|                                                                                                                                                                                                                                                                                                       |                                     |                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------|
| <b>Preamble:</b><br>This course is enabled to apply in programming languages, software development, cryptography, and algorithm. The fundamentals of Machine Learning are deeply rooted in discrete mathematics. Digital image processing uses discrete mathematics to merge images or apply filters. |                                     |                   |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                       | <b>LOGIC AND PROOFS</b>             | <b>12 Periods</b> |
| Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.                                                                                                                        |                                     |                   |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                      | <b>COMBINATORICS</b>                | <b>12 Periods</b> |
| Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.         |                                     |                   |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                     | <b>GRAPHS</b>                       | <b>12 Periods</b> |
| Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.                                                                                                                            |                                     |                   |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                      | <b>ALGEBRAIC STRUCTURES</b>         | <b>12 Periods</b> |
| Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.                                                                                                                   |                                     |                   |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                       | <b>LATTICES AND BOOLEAN ALGEBRA</b> | <b>12 Periods</b> |
| Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra – Sub Boolean Algebra – Boolean Homomorphism.                                                      |                                     |                   |

**TOTAL: 60 Periods**



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | [1] Rosen. K.H., "Discrete Mathematics and its Applications", 7 <sup>th</sup> Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.<br>[2] Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30 <sup>th</sup> Reprint, 2011                                                                                                                                                                                                                                                                                             |
| <b>Reference Books:</b>    | [1] Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5 <sup>th</sup> Edition, Pearson Education Asia, Delhi, 2013.<br>[2] Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.<br>[3] Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3 <sup>rd</sup> Edition, 2010.                                                                                                                                                                                                                                              |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.math.cmu.edu/~mraddclif/teaching/127S19/Notes/Logic%20and%20Proof.pdf">https://www.math.cmu.edu/~mraddclif/teaching/127S19/Notes/Logic%20and%20Proof.pdf</a><br><a href="https://math.libretexts.org/Bookshelves/Combinatorics_and_Discrete_Mathematics">https://math.libretexts.org/Bookshelves/Combinatorics and Discrete Mathematics</a><br><a href="http://www.cecl.ac.in/images/pdf_docs/studymaterial/cse/s3/dcs4.pdf">http://www.cecl.ac.in/images/pdf_docs/studymaterial/cse/s3/dcs4.pdf</a><br><a href="https://onlinecourses.nptel.ac.in/noc20_cs82/preview">https://onlinecourses.nptel.ac.in/noc20_cs82/preview</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | To apply the engineering knowledge to solve the logic of a program.                                    | Apply (K3)           |
| <b>CO2</b>                                                | To understand and analyze the structures of problems on mathematical induction and counting principle. | Understand (K2)      |
| <b>CO3</b>                                                | To apply the fundamentals of graph theory using modern tools in computer networking to manage projects | Apply (K3)           |
| <b>CO4</b>                                                | To apply the notion of groups, rings and fields to design and solve the algebraic structures problems. | Apply (K3)           |
| <b>CO5</b>                                                | To acquire the knowledge of engineering in real life phenomena by solving Lattices and Boolean algebra | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 3   | 2   | -   | -   | -   | -   | -   | -   | -    | -    | 2    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO3</b>  | -   | 3   | 2   | -   | -   | 2   | -   | -   | -   | 3    | -    | -    | -    | -    | -    |
| <b>CO4</b>  | -   | 2   | 2   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO5</b>  | -   | 2   | 2   | 2   | -   | -   | -   | -   | -   | 2    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23CS901 - DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION**

| Prerequisite | Program Name                                  | Sem | Category | L | T | P | C |
|--------------|-----------------------------------------------|-----|----------|---|---|---|---|
| Nil          | B. E / B. Tech - Common to CSE, IT, and AI&DS | III | ESC      | 3 | 0 | 2 | 4 |

**II - Course Objectives**

|    |                                                                                                        |
|----|--------------------------------------------------------------------------------------------------------|
| 1. | To analyze and design combinational circuits.                                                          |
| 2. | To analyze and design sequential circuits.                                                             |
| 3. | To understand the basic structure and operation of a digital computer.                                 |
| 4. | To study the design of data path unit, control unit for processor and to familiarize with the hazards. |
| 5. | To understand the concept of various memories and I/O interfacing.                                     |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                             |                                     |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                             | <b>COMBINATIONAL LOGIC</b>          | <b>9 Periods</b> |
| Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers - Demultiplexers                                                                                                                                                               |                                     |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                            | <b>SYNCHRONOUS SEQUENTIAL LOGIC</b> | <b>9 Periods</b> |
| Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters                                                                                 |                                     |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                           | <b>COMPUTER FUNDAMENTALS</b>        | <b>9 Periods</b> |
| Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language |                                     |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                            | <b>PROCESSOR</b>                    | <b>9 Periods</b> |
| Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Micro programmed Control – Pipelining – Data Hazard – Control Hazards                                                                                                                                                                                          |                                     |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                             | <b>MEMORY AND I/O</b>               | <b>9 Periods</b> |
| Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA                                                                                                                   |                                     |                  |

**TOTAL: 45 Periods****PRACTICAL EXERCISES:**

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.
4. Implementation of code converters.
5. Implementation of BCD adder, encoder and decoder circuits.
6. Implementation of functions using Multiplexers.
7. Implementation of the synchronous counters.
8. Implementation of a Universal Shift register.
9. Simulator based study of Computer Architecture

**TOTAL: 30 Periods****Total : 45+30 = 75 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.<br>2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020                                                                                                                                                                                                                      |
| <b>Reference Books:</b>    | 1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.<br>2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.<br>2. M. Morris Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018. |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/117106086">https://nptel.ac.in/courses/117106086</a><br><a href="https://ieeexplore.ieee.org/document/1463186">https://ieeexplore.ieee.org/document/1463186</a><br><a href="https://www.youtube.com/watch?v=AtfXJOPNesk">https://www.youtube.com/watch?v=AtfXJOPNesk</a>                                                                                                                                                        |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                         | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Design various combinational digital circuits using logic gates                         | Apply (K3)           |
| CO2                                                       | Describe the operation and construction of various flip flops.                          | Understand (K2)      |
| CO3                                                       | Design sequential circuits and analyze the design procedures.                           | Apply (K3)           |
| CO4                                                       | State the fundamentals of computer systems and analyze the execution of an instruction. | Understand (K2)      |
| CO5                                                       | Analyze different types of control design and identify hazards.                         | Analyze (K4)         |
| CO6                                                       | Identify the characteristics of various memory systems and I/O communication.           | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-------|-------|-------|
| CO1         | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | -   | -    | -    | 2    | -     | -     | -     |
| CO2         | 3   | 3   | 3   | 3   | 1   | -   | -   | -   | -   | -    | -    | 1    | -     | -     | -     |
| CO3         | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | -   | -    | -    | 2    | -     | -     | -     |
| CO4         | 3   | 3   | 3   | 3   | 1   | -   | -   | -   | -   | -    | -    | 1    | -     | -     | -     |
| CO5         | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | -   | -    | -    | 2    | -     | -     | -     |
| CO6         | 3   | 3   | 3   | 3   | 1   | -   | -   | -   | -   | -    | -    | 1    | -     | -     | -     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

**I - Course Name: 23IT301-DATA STRUCTURES AND ALGORITHMS USING PYTHON**

| Prerequisite                 | Program Name | Sem | Category | L | T | P | C |
|------------------------------|--------------|-----|----------|---|---|---|---|
| 23CS201 - Python Programming | B. Tech - IT | III | PCC      | 3 | 0 | 2 | 4 |

**II - Course Objectives**

|   |                                                                                                                       |
|---|-----------------------------------------------------------------------------------------------------------------------|
| 1 | To learn object-oriented programming concepts and algorithmic problem-solving approaches with Python data structures. |
| 2 | To classify the fundamental data structures like arrays, linked lists, stacks, and queues.                            |
| 3 | To acquire a knowledge of sorting, searching, and hashing data efficiently.                                           |
| 4 | To master the concepts of various tree-based data structures along with their traversal techniques.                   |
| 5 | To guide students in applying graph structures to solve complex problems.                                             |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                       |                                                       |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------|
| <b>Preamble:</b> Data Structures and Algorithms using Python is a foundational course that equips students with the tools to analyze problems, design efficient solutions, and implement them using Python. This course fosters computational thinking and problem-solving skills essential for software development. |                                                       |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                       | <b>INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS</b> | <b>9 Periods</b> |
| Introduction to Data Structures – Types – Object Oriented Programming (OOPs) Concepts in Python – Classes and Objects – Inheritance – Namespaces – Shallow and Deep copying - Introduction to Analysis of Algorithms – Asymptotic Notations – Divide and Conquer – Recursion – Analyzing Recursive Algorithms.        |                                                       |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                      | <b>LINEAR DATA STRUCTURES</b>                         | <b>9 Periods</b> |
| Abstract Data Types (ADTs) - List ADT – Array-based implementations – Linked list implementations – Singly-linked lists – Doubly linked lists - Circularly linked lists – Stack ADT – Queue ADT – Applications.                                                                                                       |                                                       |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                     | <b>SORTING, SEARCHING AND HASHING TECHNIQUES</b>      | <b>9 Periods</b> |
| Sorting: Bubble sort – Selection sort – Insertion sort – Merge sort – Quick sort – Analysis of sorting algorithms – Searching: Linear search – Binary search – Hashing: Components – Types of Hash Functions - Collision – Collision Resolution Techniques – Load factors and Rehashing.                              |                                                       |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                      | <b>NON – LINEAR DATA STRUCTURES - TREES</b>           | <b>9 Periods</b> |
| Tree ADT – Binary Tree ADT – Tree traversals – Binary search trees – AVL trees – Red Black Trees - Priority Queue (Heaps) - B – Trees.                                                                                                                                                                                |                                                       |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                       | <b>NON – LINEAR DATA STRUCTURES - GRAPHS</b>          | <b>9 Periods</b> |
| Graph ADT – Terminologies – Types of Graphs - Representation of Graph - Graph Traversals – Topological Sort – Dijkstra's Algorithm - Greedy Method Vs Dynamic Programming – Minimum Spanning Trees – Prims Algorithm – Kruskal's Algorithm.                                                                           |                                                       |                  |

**TOTAL: 45 Periods**

**LIST OF EXPERIMENTS:**

1. Implement Inheritance in Python.
2. Implement recursive algorithms in Python.
3. Implement simple Abstract Data Types (ADTs) as Python classes.
4. Implement List ADT using Python arrays.
5. Implement Linked List using Python Lists.
6. Implement Stack ADTs and Queue ADTs in Python
7. Implement Sorting and Searching Algorithms in Python
8. Implement Hash tables in Python
9. Implement Tree traversal algorithms in Python.
10. Implement Binary Search Trees in Python
11. Implement Heaps in Python.
12. Implement Graph traversal algorithms in Python.
13. Implement single source shortest path algorithm – Dijkstra's Algorithms in Python.
14. Implement minimum spanning tree algorithms – Kruskal's and Prim's Algorithms in Python.

**TOTAL: 30 Periods****Total : 45+30 = 75 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures &amp; Algorithms in Python", (An Indian Adaptation), John Wiley &amp; Sons Inc., 2021.</li> <li>2. Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015.</li> </ol>                                                                                                                                                                                               |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Narasimha Karumanchi, "Data Structures and Algorithmic Thinking with Python" Careermonk, 2015.</li> <li>2. Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley &amp; Sons, 2011</li> <li>3. Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.</li> <li>4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.</li> </ol>                  |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc22_cs26/preview">https://onlinecourses.nptel.ac.in/noc22_cs26/preview</a><br><a href="https://www.geeksforgeeks.org/courses/Data-Structures-With-Python">https://www.geeksforgeeks.org/courses/Data-Structures-With-Python</a><br><a href="https://www.udemy.com/course/data-structures-algorithms-in-python">https://www.udemy.com/course/data-structures-algorithms-in-python</a><br><a href="https://www.youtube.com/watch?v=pkYVomU3MgA">https://www.youtube.com/watch?v=pkYVomU3MgA</a> |



## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                     | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| C01                                                       | Understand the concepts of object-oriented programming with Python data structures to create efficient solutions.                   | Understand (K2)      |
| C02                                                       | Implement and analyze linear data structures (lists, stacks, queues) to effectively model and solve various computational problems. | Analyze (K4)         |
| C03                                                       | Apply sorting, searching and hashing techniques to solve problems efficiently.                                                      | Apply (K3)           |
| C04                                                       | Implement and analyze various tree structures for efficient data storage and retrieval.                                             | Analyze (K4)         |
| C05                                                       | Implement graph algorithms for modelling and solving real-world problems.                                                           | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| C01         | 1   | 2   | 2   | 3   | 1   | -   | -   | -   | 2   | 1    | 2    | 1    | 1    | 1    | 1    |
| C02         | 2   | 3   | 2   | 2   | 2   | -   | -   | -   | 2   | 2    | 2    | 2    | 3    | 2    | 2    |
| C03         | 2   | 2   | 3   | 2   | 3   | -   | -   | -   | 3   | 2    | 2    | 2    | 3    | 2    | 2    |
| C04         | 3   | 3   | 3   | 3   | 1   | -   | -   | -   | 3   | 2    | 2    | 2    | 3    | 2    | 2    |
| C05         | 3   | 3   | 3   | 3   | 1   | -   | -   | -   | 3   | 2    | 2    | 2    | 3    | 2    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23CS302 - FOUNDATIONS OF DATA SCIENCE

| Prerequisite                 | Program Name                        | Sem | Category | L | T | P | C |
|------------------------------|-------------------------------------|-----|----------|---|---|---|---|
| 23CS201 - Python Programming | B.E/B. Tech. – Common to CSE and IT | III | PC       | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                       |
|---|-----------------------------------------------------------------------|
| 1 | To understand the data science fundamentals and process               |
| 2 | To learn to describe the data for the data science process            |
| 3 | To learn to describe the relationship between data                    |
| 4 | To utilize the Python libraries for Data Wrangling                    |
| 5 | To present and interpret data using visualization libraries in Python |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                            |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------|
| <b>Preamble:</b> This course covers the foundational aspects of Data Science with understanding and describing different types of data and variables. It explores various techniques for analysing relationships within data sets, gain practical skills in data manipulation using Python libraries such as Numpy and Pandas. Also it focuses on data visualization techniques using Matplotlib and Seaborn libraries in Python. |                                            |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>INTRODUCTION</b>                        | <b>9 Periods</b> |
| Data Science: Benefits and uses - facets of data - Data Science Process: Overview - Defining research goals - Retrieving data - Data preparation - Exploratory Data analysis - build the model - presenting findings and building applications - Data Mining - Data Warehousing - Basic Statistical descriptions of Data.                                                                                                         |                                            |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>DESCRIBING DATA</b>                     | <b>9 Periods</b> |
| Types of Data - Types of Variables -Describing Data with Tables and Graphs - Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores.                                                                                                                                                                                                                                               |                                            |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>DESCRIBING RELATIONSHIPS</b>            | <b>9 Periods</b> |
| Correlation - Scatter plots - correlation coefficient for quantitative data - computational formula for correlation coefficient - Regression - regression line - least squares regression line - Standard error of estimate - interpretation of $r^2$ - multiple regression equations - regression towards the mean.                                                                                                              |                                            |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>PYTHON LIBRARIES FOR DATA WRANGLING</b> | <b>9 Periods</b> |
| Basics of Numpy arrays - aggregations - computations on arrays - comparisons, masks, boolean logic - fancy indexing - structured arrays - Data manipulation with Pandas - data indexing and selection - operating on data - missing data - Hierarchical indexing - combining datasets - aggregation and grouping - pivot tables.                                                                                                  |                                            |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>DATA VISUALIZATION</b>                  | <b>9 Periods</b> |
| Importing Matplotlib - Line plots - Scatter plots - visualizing errors - density and contour plots - Histograms - legends - colors - subplots - text and annotation - customization - three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn - Seaborn categorical plots-Case Study: Stock market.                                                                                                |                                            |                  |

Total : 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)</li> <li>2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III)</li> <li>3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)</li> </ol> |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.</li> </ol>                                                                                                                                                                                                                                                   |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/106106179">https://nptel.ac.in/courses/106106179</a><br><a href="https://nptel.ac.in/courses/106106212">https://nptel.ac.in/courses/106106212</a>                                                                                                                                                                                                             |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                         | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the data science process                                     | Understand (K2)      |
| <b>CO2</b>                                                | Understand different types of data description for data science process | Apply (K3)           |
| <b>CO3</b>                                                | Gain knowledge on relationships between data                            | Apply (K3)           |
| <b>CO4</b>                                                | Use the Python Libraries for Data Wrangling                             | Apply(K3)            |
| <b>CO5</b>                                                | Apply visualization Libraries in Python to interpret and explore data   | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | 3   | 3   | 3   | -   | -   | 2   | 2   | 3    | 2    | 3    | 2    | 2    | 2    |
| <b>CO2</b>  | 2   | 2   | 2   | 3   | 3   | -   | -   | 3   | 2   | 2    | 2    | 2    | 2    | 2    | 2    |
| <b>CO3</b>  | 2   | 3   | 2   | 2   | 3   | -   | -   | 2   | 2   | 2    | 1    | 2    | 2    | 2    | 2    |
| <b>CO4</b>  | 2   | 2   | 2   | 2   | 3   | -   | -   | 3   | 2   | 2    | 1    | 2    | 3    | 2    | 3    |
| <b>CO5</b>  | 2   | 2   | 3   | 2   | 1   | -   | -   | 1   | 2   | 2    | 1    | 2    | 3    | 2    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

## I - Course Name: 23CS303 - OBJECT ORIENTED PROGRAMMING USING JAVA

| Prerequisite                      | Program Name                        | Sem | Category | L | T | P | C |
|-----------------------------------|-------------------------------------|-----|----------|---|---|---|---|
| Problem Solving and C Programming | B.E/B. Tech. – Common to CSE and IT | III | PCC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                            |
|---|--------------------------------------------------------------------------------------------|
| 1 | To understand Object Oriented Programming concepts and basics of Java programming language |
| 2 | To know the principles of packages, inheritance and interfaces                             |
| 3 | To develop a java application with threads and generics classes                            |
| 4 | To define exceptions and use I/O streams                                                   |
| 5 | To design and build Graphical User Interface Application using JAVA FX                     |

## III - Course Content

**Preamble:** This course enables the student to learn the fundamentals of Java with Object Oriented Programming. They will be able to create, modify, and work with classes and objects in order to use them for handling exceptions and solving problems in the real world. Java swing, event handling and multi-threading concept will be useful for them to design Graphical User Interfaces for various applications.

|                                                                                                                                                                                                                                                                                                                                                                    |                                                       |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                    | <b>INTRODUCTION TO OOP AND JAVA</b>                   | <b>9 Periods</b> |
| Overview of OOP – Object oriented programming paradigms – Features of Object-Oriented Programming – Java Buzzwords –Java Ecosystem: JDK - JRE - JVM - Running a Java Program - Defining a class and creating objects - Constructors - Access control - static keyword - arrays - strings - inner class - package.                                                  |                                                       |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                   | <b>INHERITANCE, PACKAGES AND INTERFACES</b>           | <b>9 Periods</b> |
| Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.              |                                                       |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                  | <b>EXCEPTION HANDLING AND MULTITHREADING</b>          | <b>9 Periods</b> |
| Exception Handling: Definition - Exception Hierarchy - try - throw - catch paradigm - finally - handling multiple exceptions. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication- Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing. |                                                       |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                   | <b>I/O, GENERICS, STRING HANDLING</b>                 | <b>9 Periods</b> |
| I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.                                                                                                          |                                                       |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                    | <b>JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS</b> | <b>9 Periods</b> |
| JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, Toggle Button – Radio Buttons – List View – Combo Box – Choice Box – Text Controls – Scroll Pane. Layouts – Flow Pane – HBox and VBox – Border Pane – Stack Pane – Grid Pane. Menu basics. JDBC: ODBC – JDBC basics – Steps to build database applications           |                                                       |                  |

Total : 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Herbert Schildt, "Java: The Complete Reference", 11 <sup>th</sup> Edition, McGraw Hill Education, NewDelhi, 2019.<br>2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 <sup>st</sup> Edition, McGraw Hill Education, NewDelhi, 2015.                                                                                                                             |
| <b>Reference Books:</b>    | 1. Paul J. Deitel, and Harvey M. Deitel, "Java for Programmers", Pearson Education, 2nd Edition, 2012.<br>2. Cay Horstmann, and Gary Cornell, "Core Java Volume - I Fundamentals", Prentice Hall, 9th Edition, 2011.<br>3. Herbert Schildt, "The Complete Reference JAVA 2", Tata McGraw Hill, 5th Edition, 2002.<br>4. Oracle Java Documentation, "The Java Tutorials", 5. |
| <b>MOOC/Web Platforms:</b> | 1. <a href="https://docs.oracle.com/javase/tutorial/index.html">https:// docs.oracle.com/ javase/tutorial/ index.html</a> .<br>2. <a href="https://www.javatpoint.com/javafx-tutorial">https://www.javatpoint.com/javafx-tutorial</a>                                                                                                                                       |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Summarize classes with access controls to create objects for real world scenarios.        | Understanding (K2)   |
| CO2                                                       | Utilize the principle of Inheritance, Packages and Interface.                             | Apply (K3)           |
| CO3                                                       | Use of exception handling mechanisms and multithreaded model to solve real world problems | Apply (K3)           |
| CO4                                                       | Illustrate Java applications with I/O packages, string classes and generics concepts      | Understand (K2)      |
| CO5                                                       | Develop and Design Graphical User Interface Application using JAVA FX.                    | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 1   | 1   | 3   | 1   | 3   | -   | -   | -   | 3   | 2    | 2    | 2    | 3    | 1    | 2    |
| CO2         | 2   | 1   | 3   | 2   | 1   | -   | -   | -   | 2   | 1    | 1    | 3    | 3    | 3    | 2    |
| CO3         | 3   | 3   | 1   | 2   | 2   | -   | -   | -   | 3   | 2    | 1    | 2    | 3    | 1    | 3    |
| CO4         | 3   | 1   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 3    | 3    | 1    | 1    |
| CO5         | 1   | 1   | 2   | 3   | 2   | -   | -   | -   | 3   | 2    | 1    | 2    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



## I - Course Name: 23CS311 - DATA SCIENCE LABORATORY

| Prerequisite       | Program Name                      | Sem | Category | L | T | P | C   |
|--------------------|-----------------------------------|-----|----------|---|---|---|-----|
| Python Programming | B.E/B. Tech. – Common to CSE & IT | III | PC       | 0 | 0 | 3 | 1.5 |

## II - Course Objectives

|   |                                                                               |
|---|-------------------------------------------------------------------------------|
| 1 | To understand the python libraries for data science                           |
| 2 | To understand the basic Statistical and Probability measures for data science |
| 3 | To learn descriptive analytics on the benchmark data sets                     |
| 4 | To apply correlation and regression analytics on standard data sets           |
| 5 | To present and interpret data using visualization packages in Python          |

## LIST OF EXPERIMENTS:

- Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
- Implementation of python programs using NumPy arrays.
- Implementation of python programs using Pandas data frames.
- Implementation of python programs to perform descriptive analytics on the Iris data set by reading text files, Excel and the web of Iris data set.
- Implementation of python programs to perform the following analysis on diabetes data set from UCI and Pima Indians Diabetes data set :
  - Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
  - Bivariate analysis: Linear and logistic regression modeling
  - Multiple Regression analysis
  - Compare the results of the above analysis for the two data sets.
- Implementation of python programs to apply and explore various plotting functions on UCI data sets.
  - Normal curves
  - Density and contour plots
  - Correlation and scatter plots
  - Histograms
  - Three dimensional plotting
- Implementation of python programs for visualizing Geographic Data with Basemap

TOTAL : 45 Periods

## LIST OF EQUIPMENTS :(30 Students per Batch)

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

Note: Example data sets like: UCI, Iris, Pima Indians Diabetes etc.

  
 Chairperson - Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Make use of the python libraries for data science                            | Apply (K3)           |
| <b>CO2</b>                                                | Make use of the basic Statistical and Probability measures for data science. | Apply (K3)           |
| <b>CO3</b>                                                | Perform descriptive analytics on the benchmark data sets.                    | Apply (K3)           |
| <b>CO4</b>                                                | Perform correlation and regression analytics on standard data sets           | Apply (K3)           |
| <b>CO5</b>                                                | Present and interpret data using visualization packages in Python.           | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | 1   | 1   | -   | -   | -   | -   | 1   | 3    | 3    | 3    | 2    | 2    | 2    |
| <b>CO2</b>  | 3   | 2   | 2   | 3   | 1   | -   | -   | -   | 3   | 1    | 3    | 2    | 2    | 2    | 2    |
| <b>CO3</b>  | 3   | 2   | 1   | 3   | 1   | -   | -   | -   | 2   | 1    | 1    | 1    | 3    | 2    | 2    |
| <b>CO4</b>  | 2   | 3   | 1   | 3   | -   | -   | -   | -   | 2   | 3    | 2    | 3    | 3    | 3    | 3    |
| <b>CO5</b>  | 1   | 2   | 3   | 1   | 1   | -   | -   | -   | 2   | 1    | 3    | 1    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23CS312 - OBJECT ORIENTED PROGRAMMING USING JAVA LABORATORY**

| Prerequisite                                | Program Name                     | Sem | Category | L | T | P | C   |
|---------------------------------------------|----------------------------------|-----|----------|---|---|---|-----|
| 23GE101 - Problem Solving and C Programming | B.E/B.Tech. – Common to CSE & IT | III | PCC      | 0 | 0 | 3 | 1.5 |

**II - Course Objectives**

|   |                                                                                                                                                                                               |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To cultivate software development proficiency through object-oriented programming techniques applicable to real-world scenarios.                                                              |
| 2 | To foster understanding and implementation of fundamental concepts including classes, packages, interfaces, inheritance, exception handling, and file processing within software development. |
| 3 | To facilitate comprehension and practical application of event handling mechanisms in software development.                                                                                   |

**III - Course Content**

| LIST OF EXPERIMENTS: |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                   | Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)                                                                                                                                                                                                                                                                                                                                            |
| 2.                   | Develop stack and queue data structures using classes and objects.                                                                                                                                                                                                                                                                                                                                                                                           |
| 3.                   | Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary. |
| 4.                   | Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area( ) that prints the area of the given shape.                                                                                                |
| 5.                   | Solve the above problem using an interface.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 6.                   | Implement exception handling and creation of user defined exceptions.                                                                                                                                                                                                                                                                                                                                                                                        |
| 7.                   | Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.                                                                                                                             |
| 8.                   | Write a program to perform file operations.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 9.                   | Develop applications using JavaFX controls, layouts and menus.                                                                                                                                                                                                                                                                                                                                                                                               |
| 10.                  | Develop a mini project for any application using the constructs of Java.                                                                                                                                                                                                                                                                                                                                                                                     |

**LIST OF EQUIPMENTS :(30 Students per Batch)**

Tools: NetBeans IDE/ Eclipse/ Visual Studio/Spring tool SDS

**TOTAL: 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                                      | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Implement the simple java programs using object-oriented programming concepts                                                                                        | Apply (K3)           |
| CO2                                                       | Illustrate simple applications using package and exceptions.                                                                                                         | Understand (K2)      |
| CO3                                                       | Implement the applications using multithreading and files.                                                                                                           | Apply (K3)           |
| CO4                                                       | Create GUIs and event driven programming applications.                                                                                                               | Create (K6)          |
| CO5                                                       | Execute the real-world problem in team by applying the appropriate features of object-oriented programming paradigm with best practices and document its methodology | Apply (K3)           |

|                     |                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Text Books:         | 1. Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education, New Delhi, 2019.<br>2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015.                                                                                                                                              |
| Reference Books:    | 1. Paul J. Deitel, and Harvey M. Deitel, "Java for Programmers", Pearson Education, 2nd Edition, 2012.<br>2. Cay Horstmann, and Gary Cornell, "Core Java Volume - I Fundamentals", Prentice Hall, 9th Edition, 2011.<br>3. Herbert Schildt, "The Complete Reference JAVA 2", Tata McGraw Hill, 5th Edition, 2002.<br>4. Oracle Java Documentation, "The Java Tutorials". |
| MOOC/Web Platforms: | <a href="https://docs.oracle.com/javase/tutorial/index.html">https:// docs.oracle.com/ javase/tutorial/ index.html</a> .<br><a href="https://www.javatpoint.com/javafx-tutorial">https://www.javatpoint.com/javafx-tutorial</a>                                                                                                                                          |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----------|-----------|-----------|
| CO1         | 2   | 1   | 2   | 1   | -   | -   | -   | -   | 1   | 2    | 2    | 2    | 1         | 2         | 3         |
| CO2         | 2   | 1   | 3   | 1   | -   | -   | -   | -   | 2   | 3    | 3    | 2    | 1         | 3         | 1         |
| CO3         | 2   | 2   | 1   | 2   | 1   | -   | -   | -   | 1   | 2    | 1    | 3    | 2         | 3         | 2         |
| CO4         | 2   | 2   | 1   | 3   | -   | -   | -   | -   | 3   | 1    | 1    | 1    | 2         | 1         | 2         |
| CO5         | 1   | 3   | 3   | 1   | 3   | -   | -   | -   | 1   | 1    | 1    | 1    | 2         | 1         | 2         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



## VALUE ADDED COURSE

## I - Course Name: 23ITAO1 - Git and GitHub

| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B. Tech - IT | III | EEC      | 0 | 0 | 2 | 1 |

## II - Course Objectives

|   |                                                                     |
|---|---------------------------------------------------------------------|
| 1 | Understand the basic concepts of Git and GitHub.                    |
| 2 | Learn how to create and manage repositories.                        |
| 3 | Familiarize yourself with GitHub's web interface and core features. |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                    |                                                                        |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------|
| <b>Preamble:</b> Git and GitHub are indispensable tools for modern software development. They provide a robust version control system, enabling developers to track changes, collaborate effectively, and manage complex projects. By mastering these tools, you can enhance your productivity, improve code quality, and contribute to the open-source community. |                                                                        |                  |
| <b>Module 1</b>                                                                                                                                                                                                                                                                                                                                                    | <b>Introduction to Git and GitHub</b>                                  | <b>3 PERIODS</b> |
| Git Basics - GitHub Overview - Working with Local and Remote Repositories - Branching and Merging - Basic Collaboration                                                                                                                                                                                                                                            |                                                                        |                  |
| <b>Module 2</b>                                                                                                                                                                                                                                                                                                                                                    | <b>Collaborative Development and Project Management</b>                | <b>6 PERIODS</b> |
| Advanced Collaboration Tools - Pull Requests and Code Review - GitHub Projects - Documentation with Markdown - Community and Open Source                                                                                                                                                                                                                           |                                                                        |                  |
| <b>Module 3</b>                                                                                                                                                                                                                                                                                                                                                    | <b>Automation and CI/CD with GitHub Actions</b>                        | <b>7 PERIODS</b> |
| Introduction to GitHub Actions - Creating and Managing Workflows - Continuous Integration (CI) - Continuous Deployment (CD) - Advanced GitHub Actions                                                                                                                                                                                                              |                                                                        |                  |
| <b>Module 4</b>                                                                                                                                                                                                                                                                                                                                                    | <b>Security Practices and Advanced Git Techniques</b>                  | <b>7 PERIODS</b> |
| GitHub Security Features - Secure Coding Practices - Advanced Git Commands - Managing Large Repositories - Backup and Recovery                                                                                                                                                                                                                                     |                                                                        |                  |
| <b>Module 5</b>                                                                                                                                                                                                                                                                                                                                                    | <b>Integrations, Continuous Learning, and Professional Development</b> | <b>7 PERIODS</b> |
| Integrating with Development Tools - Third-Party Integrations - Building a GitHub Portfolio - Networking and Community Engagement - Continuous Learning and Staying Updated                                                                                                                                                                                        |                                                                        |                  |

TOTAL : 30 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV- Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                             | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------|
| C01                                                       | Understand the basics of Git and GitHub, collaborate, and manage repositories efficiently.                                  | Understand (K2)      |
| C02                                                       | Learn advanced Git/GitHub features, foster effective collaboration, and contribute meaningfully to open-source communities. | Understand (K2)      |
| C03                                                       | Apply GitHub Actions, and create automated workflows and CI/CD pipelines.                                                   | Apply (K3)           |
| C04                                                       | Analyze Git security best practices, manage large repositories effectively, and backup and recovery strategies.             | Analyze (K4)         |
| C05                                                       | Create Git/GitHub with development tools, build a strong GitHub portfolio, and engage with the developer community.         | Create (K6)          |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| C01         | 3   | 3   | 2   | 1   | 1   | -   | -   | -   | 1   | -    | -    | -    | 1    | 1    | 1    |
| C02         | 2   | 2   | 2   | 1   | 3   | 1   | -   | -   | 1   | 1    | 2    | 1    | 2    | 2    | 2    |
| C03         | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 2   | 1    | 3    | 3    | 3    | 3    | 3    |
| C04         | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 2   | 1    | 3    | 3    | 3    | 3    | 3    |
| C05         | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 2   | 1    | 3    | 3    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23CS401 - ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**

| Prerequisite                               | Program Name                      | Sem | Category | L | T | P | C |
|--------------------------------------------|-----------------------------------|-----|----------|---|---|---|---|
| 23CS302 -<br>Foundation of Data<br>Science | B.E/B.Tech. – Common to CSE, & IT | IV  | PCC      | 3 | 0 | 2 | 4 |

**II - Course Objectives**

|   |                                                               |
|---|---------------------------------------------------------------|
| 1 | Study about uninformed and Heuristic search techniques        |
| 2 | Learn techniques for reasoning under uncertainty              |
| 3 | Introduce Machine Learning and supervised learning algorithms |
| 4 | Study about ensembling and unsupervised learning algorithms   |
| 5 | Learn the basics of deep learning using neural networks       |

**III - Course Content**

**Preamble:** AIML is a specialized markup language used for creating chatbots and virtual assistants. In this course, we will explore how AIML enables us to design and develop conversational agents that can interact with users in a human-like manner.

|                                                                                                                                                                                                                                                                          |                                                      |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                          | <b>PROBLEM SOLVING</b>                               | <b>9 Periods</b> |
| Introduction to AI - AI Applications - Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – Rule based systems- Prolog                                                     |                                                      |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                         | <b>PROBABILISTIC REASONING</b>                       | <b>9 Periods</b> |
| Acting under uncertainty – Bayesian inference – naïve bayes models– Bayesian networks –exact inference in BN – approximate inference in BN -Probabilistic reasoning in recommender systems                                                                               |                                                      |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                        | <b>SUPERVISED LEARNING</b>                           | <b>9 Periods</b> |
| Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, gradient descent, Linear Classification Models: Discriminant function - Logistic regression, Naive Bayes– Support vector machine- Decision Tree, Random forests |                                                      |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                         | <b>ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING</b> | <b>9 Periods</b> |
| Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, Unsupervised learning: K-means, Instance Based Learning: KNN-anomaly detection.                                                                                   |                                                      |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                          | <b>NEURAL NETWORKS</b>                               | <b>9 Periods</b> |
| Perceptron - Multilayer perceptron, activation functions,– gradient descent optimization – stochastic gradient descent -error back propagation,–hyperparameter tuning, regularization, dropout, Convolutional Neural Networks(CNNs) -Case study                          |                                                      |                  |

**TOTAL : 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**PRACTICAL EXERCISES:**

1. Implementation of Uninformed search algorithms (BFS, DFS)
2. Implementation of Informed search algorithms (A\*, memory-bounded A\*)
3. Implement naïve Bayes models
4. Implement Bayesian Networks
5. Build Regression models
6. Build decision trees and random forests
7. Build SVM models
8. Implement ensembling techniques
9. Implement clustering algorithms
10. Implement EM for Bayesian networks
11. Build simple and deep learning NN models

**TOTAL : 30 Periods****Total Periods : 45+30 =75 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.</li> <li>2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson Education, 2007</li> <li>2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008</li> <li>3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006</li> <li>4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 (<a href="http://nptel.ac.in/">http://nptel.ac.in/</a>)</li> <li>5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.</li> <li>6. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.</li> <li>7. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014</li> <li>8. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.</li> <li>9. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.geeksforgeeks.org/">https://www.geeksforgeeks.org/</a><br><a href="https://www.javatpoint.com/">https://www.javatpoint.com/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Demonstrate the concepts of AI problems and use appropriate search algorithms for problem solving             | Apply (K3)           |
| CO2                                                       | Apply reasoning under uncertainty and predicate logic methods for knowledge representation.                   | Apply (K3)           |
| CO3                                                       | Implement supervised learning models for different Artificial Intelligence approaches to resolving a problem. | Apply (K3)           |
| CO4                                                       | Demonstrate ensembling and unsupervised models to AI techniques in machine learning.                          | Apply (K3)           |
| CO5                                                       | Illustrate the evaluation of the various algorithms and build deep learning neural network models.            | Understand(K2)       |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs / POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|-----------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO1       | 3    | 2    | 3    | 3    | -    | -    | -    | -    | 1    | 3     | 3     | 3     | 1     | 2     | 2     |
| CO2       | 1    | 1    | 1    | 3    | 1    | -    | -    | -    | 1    | 2     | 1     | 3     | 2     | 3     | 2     |
| CO3       | 2    | 1    | 2    | 1    | 1    | -    | -    | -    | 2    | 1     | 1     | 3     | 1     | 1     | 1     |
| CO4       | 3    | 1    | 3    | 1    | -    | -    | -    | -    | 2    | 1     | 2     | 1     | 2     | 2     | 2     |
| CO5       | 3    | 1    | 1    | 2    | 2    | -    | -    | -    | 3    | 1     | 2     | 3     | 2     | 1     | 2     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23CS402-DATABASE MANAGEMENT SYSTEMS

| Prerequisite                                          | Program Name                      | Sem | Category | L | T | P | C |
|-------------------------------------------------------|-----------------------------------|-----|----------|---|---|---|---|
| 23IT301 - Data Structures and Algorithms using Python | B.E/B.Tech. – Common to CSE, & IT | IV  | PCC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                            |
|---|--------------------------------------------------------------------------------------------|
| 1 | To learn the fundamentals of DBMS and relational databases like relational algebra and SQL |
| 2 | To Represent a database system using ER Model and normalization techniques                 |
| 3 | To understand the fundamental concepts of transaction, concurrency and recovery concepts   |
| 4 | To understand the file organization and query processing and optimization                  |
| 5 | To learn about the Distributed databases, NOSQL and database security                      |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                                       |                                             |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------|
| <b>Preamble:</b> The aim of the course provides the student can understand the knowledge of database management system. It includes various data models, relational databases, ER Model and normalization techniques. It also includes transactions and concurrency control , file organization and query processing. This course also introduces about distributed databases, NO SQL databases and database security |                                             |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                       | <b>RELATIONAL DATABASES</b>                 | <b>9 Periods</b> |
| Purpose of Database System – Views of data – Data Models – Database System Architecture –Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL                                                                                                                                                                   |                                             |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                      | <b>ER MODEL AND NORMAL FORMS</b>            | <b>9 Periods</b> |
| Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition, First, Second, Third Normal forms- Dependency Preservation - Boyce/Codd Normal form, Multi valued dependencies and fourth normal form, Join dependencies and Fifth Normal Normal - Denormalization.                                                                       |                                             |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                     | <b>TRANSACTIONS AND CONCURRENCY CONTROL</b> | <b>9 Periods</b> |
| Transaction Concepts – ACID Properties – Schedules – Serializability – Need for Concurrency – Concurrency control –Two Phase Locking- Timestamp – Multiversion – Deadlock Handling – Recovery techniques – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm.                                                                                                                         |                                             |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                      | <b>DATA STORAGE AND INDEXING</b>            | <b>9 Periods</b> |
| RAID -File Organizations- Organization of Records in Files- Data dictionary storage-Column oriented storage, Indexing and Hashing - Primary & Secondary Indexes, Tree - structured Indexes - Multidimensional Indexes - Ordered indices, B+ tree, B tree index files -Hashing - Static hashing - Dynamic hashing - Query Processing and Optimization.                                                                 |                                             |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                       | <b>ADVANCE DATABASES</b>                    | <b>9 Periods</b> |
| Distributed Databases: Architecture, Data Storage– NOSQL Databases: CAP Theorem –Graph Databases- Object oriented databases-XML databases-Multimedia databases.                                                                                                                                                                                                                                                       |                                             |                  |

TOTAL: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                          |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2022.<br>2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017           |
| <b>Reference Books:</b>    | 1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.<br>2. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.                                                            |
| <b>MOOC/Web Platforms:</b> | 1. <a href="https://nptel.ac.in/courses/106105175">https://nptel.ac.in/courses/106105175</a> (Database Management System, IIT Kharagpur)<br>2. <a href="https://nptel.ac.in/courses/106/106/106106220">https://nptel.ac.in/courses/106/106/106106220</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Construct SQL Queries using relational algebra                                                                         | Apply(K3)            |
| <b>CO2</b>                                                | Make use of design database using ER model and normalize the database                                                  | Apply(K3)            |
| <b>CO3</b>                                                | Utilize queries to handle transaction processing and maintain consistency of the database                              | Apply(K3)            |
| <b>CO4</b>                                                | Examine various indexing strategies and apply the knowledge to tune the performance of the database                    | Analyze(K4)          |
| <b>CO5</b>                                                | Justify how advanced databases differ from Relational Databases and find a suitable database for the given requirement | Evaluate(K5)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs / POs  | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO1</b> | 2    | 2    | 3    | 2    | 1    | -    | -    | -    | 2    | 1     | 1     | 1     | 1     | 1     | -     |
| <b>CO2</b> | 3    | 1    | 1    | 1    | 1    | -    | -    | -    | 2    | 3     | 3     | 3     | 2     | 2     | -     |
| <b>CO3</b> | 3    | 2    | 3    | 2    | 1    | -    | -    | -    | 2    | 1     | 1     | 2     | 2     | 2     | -     |
| <b>CO4</b> | 1    | 2    | 3    | 2    | -    | -    | -    | -    | 3    | 2     | 2     | 3     | 2     | 2     | -     |
| <b>CO5</b> | 1    | 1    | 3    | 3    | 2    | -    | -    | -    | 1    | 3     | 3     | 1     | 2     | 2     | -     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

**I - Course Name: 23IT401 - OBJECT ORIENTED SOFTWARE MODELLING AND DEVELOPMENT**

| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B. Tech IT   | IV  | PCC      | 3 | 0 | 2 | 4 |

**II - Course Objectives**

|   |                                                                                                                                      |
|---|--------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand the core principles and concepts of Object-Oriented (OO) software development.                                         |
| 2 | To effectively analyze software requirements, estimate project timelines and resources, and apply industry – standard methodologies. |
| 3 | To learn how to model software systems using UML (Unified Modeling Language) and design patterns.                                    |
| 4 | To gain practical experience in the development and implementation of object-oriented software solutions.                            |
| 5 | To understand software testing and maintenance strategies within the context of object-oriented systems.                             |

**III - Course Content**

**Preamble:** Object-oriented software modeling and development provides a structured approach to designing systems using concepts like encapsulation, inheritance, and polymorphism. It enhances reusability, scalability, and efficiency in software engineering.

|                                                                                                                                                                                                                                                                                                                                                                                           |                                             |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>INTRODUCTION</b>                         | <b>9 Periods</b> |
| Introduction to Software Engineering, Software Process- Object oriented methodologies- Terminologies used in object-oriented development- Object oriented Software life cycle models- Introduction to Agility- Agile Process-Extreme programming-XP Process                                                                                                                               |                                             |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                          | <b>REQUIREMENTS ANALYSIS AND ESTIMATION</b> | <b>9 Periods</b> |
| Requirement analysis and specification- Software Requirement Specification- Formal system specification – Finite State Machines – Petrinets- Software Requirement Elicitation techniques- Object oriented software Estimation: Agile Estimation method                                                                                                                                    |                                             |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                         | <b>MODELLING USING UML</b>                  | <b>9 Periods</b> |
| Identification of class-Identification of relationships- Identifying state and behavior -Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modelling – Data Flow Diagram- Interaction diagrams-sequence and collaboration diagrams - Case Study: create UML diagrams for any given application. |                                             |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                          | <b>SOFTWARE DESIGN</b>                      | <b>9 Periods</b> |
| Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles – Layered - Client Server - Tiered - Pipe and filter- User interface design- Case Study: for the given application do design.          |                                             |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>SOFTWARE TESTING</b>                     | <b>9 Periods</b> |
| Basics of testing– Black box testing– White box testing –Unit Testing - Integration and System testing– Regression testing -Functional Testing-Structural Testing– Class Testing – Levels of testing - Debugging - Program analysis – Model Checking-Testing Tools-Software Project Management – Maintenance of object-oriented software.                                                 |                                             |                  |

**TOTAL: 45 Periods**



**LIST OF EXPERIMENTS:**

1. Identify a software system that needs to be developed, such as a Passport Automation System for streamlining application, verification, and tracking processes.
2. Document the Software Requirements Specification (SRS) for the identified system, such as a Banking Management System
3. Identify use cases and develop the Use Case model for the system, such as an Exam Registration system, including use cases like "Register for Exam," "Pay Exam Fees," and "Download Hall Ticket."
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design
8. Test the software system for all the scenarios identified as per the usecase diagram
9. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
10. Implement the modified system and test it for various scenarios.

**SUGGESTED DOMAINS FOR MINI-PROJECT:**

1. Passport automation system
2. Banking management system
3. Exam registration
4. Stock maintenance system.
5. Online course reservation system
6. Airline/Railway reservation system
7. e-book management system
8. Recruitment system
9. Library management system
10. Student information system

**Note:** The students can obtain any 2 domains for the Mini Project suggested above.

**Total:** 30 Periods

**Total:** 45+30= 75 Periods

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | <ol style="list-style-type: none"> <li>1. Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014.</li> <li>2. Yogesh Singh, Ruchika Malhotra, " Object Oriented Software Engineering", PHI Learning Private Ltd., Eastern Economy Edition, 2012</li> <li>3. Stephen R. Schach, " Object-Oriented and Classical Software Engineering" Eighth Edition, y McGraw-Hill, 2011</li> </ol>                                                                                                                                                                                                                                                           |
| <b>Reference Books:</b> | <ol style="list-style-type: none"> <li>1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.</li> <li>2. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.</li> <li>3. Len Bass, Ingo Weber and Liming Zhu, —DevOps: A Software Architect 's Perspective, Pearson Education, 2016</li> <li>4. Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd., 2009.</li> <li>5. Stephen Schach, Object-Oriented and Classical Software Engineering, 8th ed, McGraw- Hill, 2010.</li> <li>6. Gerardus Blokdyk, Object oriented Software Engineering: A complete Guide, ISBN-10: 1867300230, 2020</li> </ol> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                      | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Compare different Software Development Lifecycle (SDLC) models and methodologies.                    | Apply (K3)           |
| CO2                                                       | Evaluate project management approaches, along with cost estimation and schedule planning strategies. | Apply (K3)           |
| CO3                                                       | Apply UML diagrams effectively for both analysis and design in object-oriented development.          | Apply (K3)           |
| CO4                                                       | Architect and design software systems using design patterns and architectural styles.                | Apply (K3)           |
| CO5                                                       | Implement testing strategies for software systems.                                                   | Understand(K2)       |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 2   | 1   | 2   | 2   | -   | -   | -   | -   | 1    | 1    | 2    | 2    | 2    | 1    |
| CO2         | 2   | 3   | 2   | 3   | 2   | -   | -   | -   | 2   | 2    | 3    | 2    | 3    | 2    | 1    |
| CO3         | 2   | 3   | 2   | 1   | 1   | -   | -   | -   | 2   | 2    | 3    | 2    | 2    | 3    | 1    |
| CO4         | 2   | 3   | 2   | 2   | 3   | -   | -   | -   | 2   | 2    | 3    | 2    | 2    | 3    | 1    |
| CO5         | 2   | 3   | 1   | 2   | 2   | -   | -   | -   | -   | -    | -    | 1    | 3    | 2    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

**I - Course Name: 23CS404 - OPERATING SYSTEMS**

| Prerequisite                                           | Program Name                      | Sem | Category | L | T | P | C |
|--------------------------------------------------------|-----------------------------------|-----|----------|---|---|---|---|
| 23CS901 - Digital Principles and Computer Organization | B.E/B.Tech. – Common to CSE, & IT | IV  | PCC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                                                      |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand the basic concepts, objectives, and evolution of operating systems and their components.                                               |
| 2 | To analyze process management techniques, including scheduling, synchronization, and deadlock management.                                            |
| 3 | To explore memory management strategies and their implementation in modern operating systems.                                                        |
| 4 | To understand storage management, file systems, and input/output systems.                                                                            |
| 5 | To gain hands-on experience with modern operating systems like Linux, iOS, and Android, and explore emerging challenges in virtualized environments. |

**III - Course Content**

**Preamble:** This course makes the students to learn the basic concepts and functions of operating systems. It helps to understand the process and threads. It also helps the students to recognize and various methods to solve problems relevant to process, process scheduling and deadlocks and illustrates the various memory management techniques and also describe the I/O management and file storage structures. This subject enables the students to be familiar with the basis of Linux system and mobile OS like IOS and Android.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                  |                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>INTRODUCTION</b>              | <b>10 Periods</b> |
| Operating System Overview - Objectives and Functions - Types of Operating system-Operating System Structures - User Operating system Interface- System Calls– Security Measures on Operating system                                                                                                                                                                                                                                                                                                                  |                                  |                   |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>PROCESS MANAGEMENT</b>        | <b>11 Periods</b> |
| Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multithread Models – Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock . |                                  |                   |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>MEMORY MANAGEMENT</b>         | <b>8 Periods</b>  |
| Memory Management Strategies - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - PageReplacement algorithm–Thrashing                                                                                                                                                                                                                                                                         |                                  |                   |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>STORAGE MANAGEMENT</b>        | <b>9 Periods</b>  |
| Storage system –Disk Scheduling algorithm-Directory Structure - Directory implementation - Directory organization - File System concept - Access methods - File system mounting-File Sharing and Protection; File System Implementation - File System Structure - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.                                                                                                                           |                                  |                   |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>ADVANCED OPERATING SYSTEM</b> | <b>7 Periods</b>  |
| Linux Operating system-Mobile OS - iOS and Android-RTOS-Emerging challenges in New Hardware- VM Ware and its implementation                                                                                                                                                                                                                                                                                                                                                                                          |                                  |                   |

**TOTAL: 45 Periods**

Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.<br>2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.                                                                                                                                                                                                                                                                                                                                                         |
| <b>Reference Books:</b>    | 1. Achyut S. Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.<br>2. Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau, "Operating Systems: Three Easy Pieces," Paperback, Imported Edition, 1 September 2018.                                                                                                                                                                                                                                                                                                                                                   |
| <b>MOOC/Web Platforms:</b> | <a href="https://archive.nptel.ac.in/courses/106106144/%20">https://archive.nptel.ac.in/courses/106106144/%20</a> - Introduction to to operating system<br><a href="https://archive.nptel.ac.in/courses/106105172/">https://archive.nptel.ac.in/courses/106105172/</a> - Realtime Operating system(RTOS)<br><a href="https://archive.nptel.ac.in/courses/106102132/">https://archive.nptel.ac.in/courses/106102132/</a> - Operating System<br><a href="https://archive.nptel.ac.in/courses/106105214/">https://archive.nptel.ac.in/courses/106105214/</a> - Operating System Fundamentals |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the evolution, objectives, and types of operating systems, including their structure, system calls, and security measures.           | Understand (K2)      |
| <b>CO2</b>                                                | Analyze process management techniques such as process scheduling, inter-process communication, synchronization, and deadlock handling.       | Analyze (K4)         |
| <b>CO3</b>                                                | Apply memory management strategies, including paging, segmentation, and virtual memory, to solve allocation and performance issues.          | Apply (K3)           |
| <b>CO4</b>                                                | Demonstrate the functioning of storage systems, disk scheduling, and file systems, and assess their implementation methods.                  | Analyze (K4)         |
| <b>CO5</b>                                                | Evaluate case studies of operating systems like Linux, iOS, Android, and RTOS, and discuss challenges in modern hardware and virtualization. | Evaluate (K5)        |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 2   | 2   | 1   | 2   | 2   | -   | -   | -   | -   | 1    | 1    | 2    | 2    | 2    | 1    |
| <b>CO2</b>  | 2   | 3   | 2   | 3   | 2   | -   | -   | -   | 2   | 2    | 3    | 2    | 3    | 2    | 1    |
| <b>CO3</b>  | 2   | 3   | 2   | 1   | 1   | -   | -   | -   | 2   | 2    | 3    | 2    | 2    | 3    | 1    |
| <b>CO4</b>  | 2   | 3   | 2   | 2   | 3   | -   | -   | -   | 2   | 2    | 3    | 2    | 2    | 3    | 1    |
| <b>CO5</b>  | 2   | 3   | 1   | 2   | 2   | -   | -   | -   | -   | -    | -    | 1    | 3    | 2    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



## I - Course Name: 23CS405-THEORY OF COMPUTATION

| Prerequisite                   | Program Name                      | Sem | Category | L | T | P | C |
|--------------------------------|-----------------------------------|-----|----------|---|---|---|---|
| 23MA302 - Discrete Mathematics | B.E/B.Tech. – Common to CSE, & IT | IV  | PCC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                                                             |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To learn the mathematical notations and analyze deterministic finite automata (DFA) and nondeterministic finite automata (NFA), including their equivalence and differences |
| 2 | To understand and infer the relationship of finite automata and regular expressions                                                                                         |
| 3 | To understand the language hierarchy, relationship between context free grammar and its language and to construct a PDA of CFG.                                             |
| 4 | To examine deterministic pushdown automata and the conversion between CFGs and PDAs                                                                                         |
| 5 | To understand the foundational model of Turing machines (TM) and their role in language acceptance as well as undecidability concepts.                                      |

## III - Course Content

**Preamble:** Discrete Mathematics covers the mathematical topics most directly related to computer science. Topics includes: logic, count ability and counting arguments, proof techniques. Software engineering uses graphs, trees and other data structures. Logic is used in AI research in theorem proving and in database query systems

|                                                                                                                                                                                                                                                                                                                                                                                   |                                                    |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                   | <b>AUTOMATA THEORY</b>                             | <b>9 Periods</b> |
| Basic Concepts of automata, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata-Myhill-Nerode Theorem.                                       |                                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                  | <b>REGULAR EXPRESSIONS AND LANGUAGES</b>           | <b>9 Periods</b> |
| Regular expression – Regular Languages- Equivalence of Finite Automata and regular expressions – Pumping Lemma– Closure properties of regular languages.                                                                                                                                                                                                                          |                                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                 | <b>CONTEXT FREE GRAMMAR AND PUSH DOWN AUTOMATA</b> | <b>9 Periods</b> |
| Types of Grammar - Chomsky's hierarchy of languages -Context-Free Grammar (CFG) and Languages – Derivations and Parse trees – Ambiguity in grammars and languages – Push Down Automata (PDA): Definition – Moves - Instantaneous descriptions -Languages of pushdown automata – Equivalence of pushdown automata and CFG-CFG to PDA-PDA to CFG – Deterministic Pushdown Automata. |                                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                  | <b>NORMAL FORMS</b>                                | <b>9 Periods</b> |
| Normal forms for CFG – Simplification of CFG- Chomsky Normal Form (CNF) and Greibach Normal Form (GNF) – Pumping lemma for CFL – Closure properties of Context Free Languages                                                                                                                                                                                                     |                                                    |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                   | <b>TURING MACHINE</b>                              | <b>9 Periods</b> |
| Turing machines (TM)- Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, Universal TM, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP.                               |                                                    |                  |

TOTAL: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Hopcroft J.E., Motwani R. &amp; Ullman J.D., "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education, 2008</li> <li>2. John C Martin , "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2011.</li> </ol>                                                                                                                                     |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Harry R Lewis and Christos H Papadimitriou , "Elements of the Theory of Computation", 2nd Edition, Prentice Hall of India, 2015.</li> <li>2. Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones &amp; Bartlett, 2016.</li> <li>3. K.L.P.Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata Languages and Computation", 3rd Edition, Prentice Hall of India, 2006.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/#introduction">https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/#introduction</a><br><a href="https://onlinecourses.nptel.ac.in/noc21_cs83/preview">https://onlinecourses.nptel.ac.in/noc21_cs83/preview</a>                                                                                                                                                    |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Construct deterministic and non-deterministic finite automata.                                                 | Apply (K3)           |
| <b>CO2</b>                                                | Apply regular expressions and regular languages for any pattern.                                               | Apply (K3)           |
| <b>CO3</b>                                                | Construct context free grammar and push down automata for any language.                                        | Apply (K3)           |
| <b>CO4</b>                                                | Convert context-free grammars (CFGs) into standard normal forms for efficient parsing and language processing. | Apply (K3)           |
| <b>CO5</b>                                                | Design Turing machine for computational functions, and undecidable problems.                                   | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | 2   | 2   | -   | -   | -   | -   | -   | -    | -    | 2    | 3    | 2    | 3    |
| <b>CO2</b>  | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -   | -    | -    | 2    | 3    | 2    | 2    |
| <b>CO3</b>  | 3   | 3   | 2   | 3   | -   | -   | -   | -   | -   | -    | -    | 2    | 3    | 3    | 3    |
| <b>CO4</b>  | 3   | 2   | 3   | 3   | -   | -   | -   | -   | -   | -    | -    | 3    | 3    | 2    | 3    |
| <b>CO5</b>  | 3   | 3   | 3   | 3   | -   | -   | -   | -   | -   | -    | -    | 3    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

## I - Course Name: 23EC406-Analog and Digital Communication

| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B.Tech. – IT | IV  | PCC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|    |                                                          |
|----|----------------------------------------------------------|
| 1. | To understand the types of analog modulation techniques. |
| 2. | To learn pulse and data communication techniques.        |
| 3. | To study the types of digital modulation techniques.     |
| 4. | To be familiarized with source and error control coding. |
| 5. | To gain knowledge on multi-user communication.           |

## III - Course Content

|                                                                                                                                                                                                                                                                                             |                                          |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------|
| <b>Preamble:</b>                                                                                                                                                                                                                                                                            |                                          |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                             | <b>Analog Communication</b>              | <b>9 Periods</b> |
| Introduction to Communication Systems, Modulation – Need for modulation, Types - Amplitude Modulation, Angle Modulation – Frequency Modulation and Phase Modulation, Comparison of Analog Communication Systems (AM – FM – PM) - Superheterodyne Receiver.                                  |                                          |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                            | <b>Pulse and Data Communication</b>      | <b>9 Periods</b> |
| <b>Pulse Communication:</b> Types of Pulse modulation - PAM, PWM, PPM and PCM, Comparison of Pulse Communication Systems (PAM – PWM – PPM).                                                                                                                                                 |                                          |                  |
| <b>Data Communication:</b> Process, types, circuits, codes, hardware - serial and parallel interfaces.                                                                                                                                                                                      |                                          |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                           | <b>Concepts of Digital Communication</b> | <b>9 Periods</b> |
| Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), BPSK, QPSK, DPSK, Quadrature Amplitude Modulation (QAM) – 8 QAM, Comparison of Digital Communication Systems (ASK – FSK – PSK ).                                                                      |                                          |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                            | <b>Information Theory and Coding</b>     | <b>9 Periods</b> |
| <b>Source coding theorem</b> - Entropy, mutual information, channel capacity, Shannon - Fano coding, Huffman coding.                                                                                                                                                                        |                                          |                  |
| <b>Error Control Coding</b> - linear block codes and cyclic codes.                                                                                                                                                                                                                          |                                          |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                             | <b>Multi-User Communication</b>          | <b>9 Periods</b> |
| Cellular concept and frequency reuse, channel assignment and handover techniques, Basics of multiple access techniques - TDMA, FDMA and CDMA, Global System for Mobile communication (GSM), Evolution of wireless communication, Satellite communication applications –EDUSAT and OCEANSAT. |                                          |                  |

TOTAL : 45 Periods

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | <ol style="list-style-type: none"> <li>Wayne Tomasi, "Advanced Electronic Communication Systems", 6<sup>th</sup> Edition, Pearson Education, 2009</li> <li>Simon Haykin, "Communication Systems", 4<sup>th</sup> Edition, John Wiley &amp; Sons, 2004</li> <li>Rappaport T.S, "Wireless Communications: Principles and Practice", 2<sup>nd</sup> Edition, Pearson Education, 2007</li> </ol>                                                                                                                                                                                                                                               |
| <b>Reference Books:</b> | <ol style="list-style-type: none"> <li>H.Taub, D L Schilling and G Saha, "Principles of Communication", 3<sup>rd</sup> Edition, Pearson Education, 2007.</li> <li>B. P.Lathi, "Modern Analog and Digital Communication Systems", 3<sup>rd</sup> Edition, Oxford University Press, 2007.</li> <li>Blake, "Electronic Communication Systems", Thomson Delmar Publications, 2002.</li> <li>Martin S.Roden, "Analog and Digital Communication System", 3<sup>rd</sup> Edition, Prentice Hall of India, 2002.</li> <li>B.Sklar, "Digital Communication Fundamentals and Applications" 2<sup>nd</sup> Edition Pearson Education 2007.</li> </ol> |

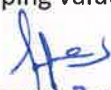
## IV - Course Outcomes

| On completion of the course, the students will be able to |                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------|----------------------|
| <b>CO1</b>                                                | Apply analog communication techniques.       | Apply (K3)           |
| <b>CO2</b>                                                | Use pulse and data communication techniques. | Apply (K3)           |
| <b>CO3</b>                                                | Apply digital Communication techniques.      | Apply (K3)           |
| <b>CO4</b>                                                | Analyze Source and Error control coding.     | Analyse(K4)          |
| <b>CO5</b>                                                | Utilize multi-user communication.            | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |
| <b>CO5</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## PRACTICALS

## I - Course Name: 23CS411-DATABASE MANAGEMENT SYSTEMS LABORATORY

| Prerequisite                                          | Program Name                      | Sem | Category | L | T | P | C   |
|-------------------------------------------------------|-----------------------------------|-----|----------|---|---|---|-----|
| 23IT301 - Data Structures and Algorithms using Python | B.E/B.Tech. – Common to CSE, & IT | IV  | PCC      | 0 | 0 | 3 | 1.5 |

## II - Course Objectives

|   |                                                                                        |
|---|----------------------------------------------------------------------------------------|
| 1 | To learn and implement important commands in SQL.                                      |
| 2 | To learn the usage of nested and joint queries.                                        |
| 3 | To understand functions, procedures and procedural extensions of databases.            |
| 4 | To understand design and implementation of typical database applications.              |
| 5 | To be familiar with the use of a front-end tool for GUI based application development. |

## LIST OF EXPERIMENTS:

1. Create a database table, add constraints (primary key, unique, check, not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore join operations.
5. Write user defined functions and stored procedures in SQL.
6. Execute complex transactions and realize DCL and TCL commands.
7. Write SQL Triggers for insert, delete, and update operations in a database table.
8. Create View and index for database tables with a large number of records.
9. Create an XML database and validate it using XML schema.
10. Create Document, column and graph-based data using NOSQL database tools.
11. Develop a simple GUI based database application and incorporate all the above-mentioned features
12. Case Study using any of the real-life database applications.

List of Equipment's: (30 Students per Batch)

MYSQL / SQL: 30 Users

TOTAL: 45 Periods

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Implement the databases with different types of key constraints.                                                   | Apply (K3)           |
| CO2                                                       | Construct simple and complex SQL queries using DML and DCL commands.                                               | Apply (K3)           |
| CO3                                                       | Use advanced features such as stored procedures and triggers and incorporate in GUI based application development. | Apply (K3)           |
| CO4                                                       | Implement an XML database and validate with meta-data (XML schema).                                                | Apply (K3)           |
| CO5                                                       | Implement and manipulate data using NOSQL database.                                                                | Apply (K3)           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPCE College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs / POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|-----------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO1       | 3    | 3    | 3    | 3    | 1    | -    | -    | -    | 3    | 1     | 3     | 2     | 1     | 1     | -     |
| CO2       | 2    | 2    | 3    | 2    | 2    | -    | -    | -    | 1    | 2     | 3     | 3     | 2     | 2     | -     |
| CO3       | 3    | 3    | 2    | 1    | 1    | -    | -    | -    | 1    | 1     | 1     | 3     | 2     | 2     | -     |
| CO4       | 1    | 3    | 3    | 3    | 1    | -    | -    | -    | 1    | 1     | 3     | 2     | 2     | 2     | -     |
| CO5       | 2    | 3    | 2    | 2    | 1    | -    | -    | -    | 2    | 2     | 3     | 1     | 2     | 2     | -     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson, Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23CS412 OPERATING SYSTEM LABORATORY**

| Prerequisite                                | Program Name                      | Sem | Category | L | T | P | C   |
|---------------------------------------------|-----------------------------------|-----|----------|---|---|---|-----|
| 23GE101 – Problem Solving and C Programming | B.E/B.Tech. – Common to CSE, & IT | IV  | PCC      | 0 | 0 | 3 | 1.5 |

**II - Course Objectives**

|   |                                                                       |
|---|-----------------------------------------------------------------------|
| 1 | To install windows operating systems.                                 |
| 2 | To understand the basics of Unix command and shell programming.       |
| 3 | To implement various CPU scheduling algorithms.                       |
| 4 | To implement Deadlock Avoidance and Deadlock Detection Algorithms     |
| 5 | To implement Page Replacement Algorithms                              |
| 6 | To implement various memory allocation methods.                       |
| 7 | To be familiar with File Organization and File Allocation Strategies. |

**III - Course Content****LIST OF EXPERIMENTS:**

1. Installation of guest Operating system using VM Ware
2. Write a UNIX Commands and Shell Programming
  - a) UNIX Commands.
  - b) Shell Programming.
3. Write a Program using System Calls for Process Management (Fork, Exit,Getpid,Wait,Close).
4. Write a Program to implement the various CPU Scheduling Algorithms.
5. Write a Program to implement mutual exclusion by semaphore.
6. Write a program to handle deadlock prevention and avoidance techniques.
7. Write a Program to implement the paging Techniques.
8. Write a Program to implement the following Memory Allocation Methods
  - a) First Fit
  - b) Worst Fit
  - c) Best Fit
9. Write a Program to implement the various Page Replacement Algorithms.
10. Write a Program to implement the following File Allocation Strategies.
  - a) Sequential
  - b) Indexed
  - c) Linked
11. Write a Program for the implementation of various disk scheduling algorithms.

**Note:** The above programs can be implemented using C/C++/PYTHON

**Note:** The lab instructor is expected to design Problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

**TOTAL: 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.</li> <li>2. Steve Shah and Wale Soyinka "Linux Administration: A Beginner's Guide", 4th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, ISBN: 978-0072262599</li> </ol>                                                                                                 |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.</li> <li>2. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.</li> <li>3. Achyut S. Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.</li> <li>4. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 2007.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <ol style="list-style-type: none"> <li>1. <a href="https://www.edx.org/learn/operating-systems#eaf4ef6d-6994-5657-8d81-9fa26f1cd572">https://www.edx.org/learn/operating-systems#eaf4ef6d-6994-5657-8d81-9fa26f1cd572</a></li> </ol>                                                                                                                                                                                                                                  |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Illustrate and define the Linux Commands.                                                                                 | Understand (K2)      |
| <b>CO2</b>                                                | Compare the performance of various CPU Scheduling Algorithms.                                                             | Analyze (K4)         |
| <b>CO3</b>                                                | Utilize the different algorithms for process communication and synchronization                                            | Apply (K3)           |
| <b>CO4</b>                                                | Implement the programs to implement deadlock avoidance algorithms, semaphores and IPC                                     | Apply (K3)           |
| <b>CO5</b>                                                | Implement the programs to implement various page replacement algorithms, file organization and file allocation strategies | Apply (K3)           |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs / POs  | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO1</b> | 3    | 1    | 3    | 1    | 1    | -    | -    | -    | 1    | 3     | 3     | 3     | 2     | 1     | 3     |
| <b>CO2</b> | 3    | 1    | 1    | 2    | 2    | -    | -    | -    | 3    | 2     | 1     | 1     | 3     | 1     | 2     |
| <b>CO3</b> | 3    | 3    | 2    | 1    | 2    | -    | -    | -    | 3    | 3     | 1     | 2     | 2     | 2     | 2     |
| <b>CO4</b> | 1    | 2    | 2    | 3    | 2    | -    | -    | -    | 3    | 1     | 3     | 1     | 1     | 2     | 1     |
| <b>CO5</b> | 2    | 2    | 1    | 1    | 3    | -    | -    | -    | 1    | 2     | 2     | 3     | 1     | 3     | 3     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## VALUE ADDED COURSE

## I - Course Name: 23ITAO2 – Mongo DB

| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B.Tech - IT  | IV  | EEC      | 0 | 0 | 2 | 1 |

## II - Course Objectives

|   |                                                                                   |
|---|-----------------------------------------------------------------------------------|
| 1 | Familiarize beginners with MongoDB, its core concepts, and basic CRUD operations. |
| 2 | Teach how to query and manipulate data efficiently.                               |
| 3 | Learn the importance of indexes and introduction to data aggregation.             |
| 4 | Introduce schema design principles and handling relationships.                    |
| 5 | Cover practical aspects, including integration and basic administration tasks.    |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                |                                                  |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------|
| <b>Preamble:</b> MongoDB is designed to equip students with essential skills in NoSQL database management. It offers hands-on experience in creating, querying, and managing data using MongoDB. The course aims to bridge academic learning with industry-relevant expertise in modern database technologies. |                                                  |                  |
| <b>Module 1</b>                                                                                                                                                                                                                                                                                                | <b>Introduction and Basics</b>                   | <b>3 Periods</b> |
| Introduction - Mongo DB - Setting Up MongoDB - Understanding MongoDB Structure - Basic Commands - CRUD Operations (Basics) - Hands-On Practice.                                                                                                                                                                |                                                  |                  |
| <b>Module 2</b>                                                                                                                                                                                                                                                                                                | <b>Querying and Data Manipulation</b>            | <b>6 Periods</b> |
| Querying Data – Projection - Sorting and Limiting Results - Updating Data (Advanced) - Working with Arrays - Hands-On Practice.                                                                                                                                                                                |                                                  |                  |
| <b>Module 3</b>                                                                                                                                                                                                                                                                                                | <b>Indexing and Aggregation Basics</b>           | <b>7 Periods</b> |
| Indexes - Introduction to Aggregation Framework - Common Aggregation Stages - Hands-On Practice                                                                                                                                                                                                                |                                                  |                  |
| <b>Module 4</b>                                                                                                                                                                                                                                                                                                | <b>Schema Design and Relationships</b>           | <b>7 Periods</b> |
| Schema Design Basics – Relationships - Data Validation - Hands-On Practice.                                                                                                                                                                                                                                    |                                                  |                  |
| <b>Module 5</b>                                                                                                                                                                                                                                                                                                | <b>Real-World Integration and Administration</b> | <b>7 Periods</b> |
| Working with MongoDB in Applications - MongoDB Atlas (Cloud Deployment) - Backup and Restore - Monitoring and Security - Applications                                                                                                                                                                          |                                                  |                  |

TOTAL: 30 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV- Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the fundamental concepts of NoSQL databases and the architecture of MongoDB.                        | Understand (K2)      |
| CO2                                                       | Develop the ability to perform CRUD operations and construct effective queries using MongoDB's query language. | Understand (K2)      |
| CO3                                                       | Apply indexing strategies and aggregation pipelines to optimize query performance and data analysis.           | Apply (K3)           |
| CO4                                                       | Design efficient MongoDB schemas and model relationships using embedded and referenced documents.              | Analyze (K6)         |
| CO5                                                       | Create skills in integrating MongoDB with applications and performing basic database administration tasks.     | Create (K6)          |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 2   | 1   | 1   | -   | -   | -   | 1   | -    | -    | -    | 1    | 1    | 1    |
| CO2         | 2   | 2   | 2   | 1   | 3   | 1   | -   | -   | 1   | 1    | 2    | 1    | 2    | 2    | 2    |
| CO3         | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 2   | 1    | 3    | 3    | 3    | 3    | 3    |
| CO4         | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 2   | 1    | 3    | 3    | 3    | 3    | 3    |
| CO5         | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 2   | 1    | 3    | 3    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23ITA03 – Node.js and Mongo DB

| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B.Tech - IT  | IV  | EEC      | 0 | 0 | 2 | 1 |

## II - Course Objectives

|   |                                                                                   |
|---|-----------------------------------------------------------------------------------|
| 1 | Introduce JavaScript fundamentals and ES6 features for backend development.       |
| 2 | Understand Node.js architecture, asynchronous programming, and core concepts.     |
| 3 | Develop server-side applications using Node.js modules and the Express framework. |
| 4 | Build RESTful APIs and handle client-server communication.                        |
| 5 | Apply error handling, best practices, and project-based implementation skills.    |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                |                                                    |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|
| <b>Preamble:</b> Node.js is designed to equip students with essential skills in server-side JavaScript development. It offers hands-on experience in building backend applications, creating RESTful APIs, and handling asynchronous operations using Node.js and Express. The course aims to bridge academic learning with industry-relevant expertise in modern web application development. |                                                    |                  |
| <b>Module 1</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>JavaScript Fundamentals</b>                     | <b>3 Periods</b> |
| Introduction to JavaScript – Role of JavaScript in Web Development – Browser vs Node.js Environment – Variables (var, let, const) – Data Types and Operators – Functions and Arrow Functions – Control Flow Statements – ES6 Features – Hands-On Practice.                                                                                                                                     |                                                    |                  |
| <b>Module 2</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>Asynchronous JavaScript and Node.js Basics</b>  | <b>6 Periods</b> |
| Asynchronous Programming – Callbacks – Promises – Async/Await – Introduction to Node.js – History and Evolution – Node.js vs Traditional Backend Languages – V8 Engine – Event Loop – Non-blocking I/O – Installation and Setup – Hands-On Practice.                                                                                                                                           |                                                    |                  |
| <b>Module 3</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>Node.js Modules and Express Framework</b>       | <b>7 Periods</b> |
| Built-in Modules (fs, http, path) – Creating Custom Modules – npm and package.json – Creating HTTP Server – Handling Routes and Requests – Introduction to Express.js – Express Server Setup – Routing – Middleware – Serving Static Files – Hands-On Practice.                                                                                                                                |                                                    |                  |
| <b>Module 4</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>MongoDB and RESTful API Development</b>         | <b>7 Periods</b> |
| Introduction to Databases – MongoDB and its Advantages – MongoDB Installation and Atlas – Connecting Node.js with MongoDB – CRUD Operations using Mongoose – Schema and Models – Creating RESTful APIs – API Testing using Postman – Hands-On Practice.                                                                                                                                        |                                                    |                  |
| <b>Module 5</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>Project, Error Handling, and Best Practices</b> | <b>7 Periods</b> |
| Mini Project Development (Student Record API) – Error Handling Techniques – Debugging – Backend Best Practices – Application Testing – Project Demonstration and Wrap-up.                                                                                                                                                                                                                      |                                                    |                  |

TOTAL: 30 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV- Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the fundamentals of JavaScript, ES6 features, and the role of Node.js in server-side web development.                       | Understand (K2)      |
| CO2                                                       | Develop backend programs using Node.js concepts such as asynchronous programming, event loop, and core modules.                        | Apply (K3)           |
| CO3                                                       | Apply Express framework concepts to build web servers and RESTful APIs for client-server communication.                                | Apply (K3)           |
| CO4                                                       | Analyze backend application requirements and design structured REST APIs with proper routing, middleware, and error handling.          | Analyze (K4)         |
| CO5                                                       | Create a complete backend application by integrating Node.js, Express, database operations, and best practices through a mini project. | Create (K6)          |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 2   | 1   | 1   | -   | -   | -   | 1   | -    | -    | -    | 1    | 1    | 1    |
| CO2         | 2   | 2   | 2   | 1   | 3   | 1   | -   | -   | 1   | 1    | 2    | 1    | 2    | 2    | 2    |
| CO3         | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 2   | 1    | 3    | 3    | 3    | 3    | 3    |
| CO4         | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 2   | 1    | 3    | 3    | 3    | 3    | 3    |
| CO5         | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 2   | 1    | 3    | 3    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23CS501 - Computer Networks**

| Prerequisite | Program Name                      | Sem | Category | L | T | P | C |
|--------------|-----------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, & IT | V   | PCC      | 3 | 0 | 2 | 4 |

**II - Course Objectives**

|   |                                                                                                                                                  |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamentals of data communication, network types, reference models, and switching techniques.                                  |
| 2 | To understand the principles and functions of Data Link Layer protocols and LAN technologies.                                                    |
| 3 | To explore network layer addressing, routing protocols, and strategies for internetworking.                                                      |
| 4 | To analyze transport and application layer protocols with emphasis on congestion control, Quality of Service (QoS), and internet-based services. |
| 5 | To study emerging networking technologies including network security, encryption, firewalls, SDN, NFV, and 5G applications.                      |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                            |                                            |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------|
| <b>Preamble:</b>                                                                                                                                                                                                                                                                                           |                                            |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                            | <b>Introduction and Physical Layer</b>     | <b>9 Periods</b> |
| Introduction to Data Communication- Networks – Network Types – Protocols - Layering – TCP/IP Protocol suite – OSI Model –Transmission media – Switching – Circuit-switched Networks – Packet Switching- Digital and Analog Signals                                                                         |                                            |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                           | <b>Data Link Layer</b>                     | <b>9 Periods</b> |
| Data Link Layer Services – Framing - Flow Control - Error Control - Data-Link Layer Protocols – HDLC – PPP – Error detection and correction - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices                                                            |                                            |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                          | <b>Network Layer &amp; Transport Layer</b> | <b>9 Periods</b> |
| IPv4 Address Space – Notations – Classful Addressing – Classless Addressing – Network Address Translation – IPv6 Address Structure – IPv4 and IPv6 header format –Introduction to Routing- Transport Layer: Transport Services - UDP - TCP - Congestion Control – SCTP-Quality of Services (QOS)           |                                            |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                           | <b>Application Layer</b>                   | <b>9 Periods</b> |
| Application layer-Domain Name System-Case Study: FTP-HTTP-SMTP-SNMP                                                                                                                                                                                                                                        |                                            |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                            | <b>Emerging Trends in Networking</b>       | <b>9 Periods</b> |
| Introduction to Network Security – Importance of Security – Basic Concepts of Encryption and Firewalls – Network Architecture - Network Management - Basics of Software defined networking (SDN)- Network Functions Virtualization(NFV)- Overview of 5G Networks – Key Features and Real-Life Applications |                                            |                  |

**TOTAL: 45 Periods**

**PRACTICAL EXERCISES:**

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyzer and examine.
2. Simulation of an error correction code (like CRC)
3. Write a code simulating ARP /RARP protocols.
4. Simulation of Distance Vector/ Link State Routing algorithm.
5. Applications using TCP sockets like: a) Echo client and echo server b) Chat
6. Simulation of DNS using UDP sockets.
7. Write a HTTP web client program to download a web page using TCP sockets.
8. Simulation of SMTP Protocol for Sending an Email using Sockets
9. Implementation of Simple Encryption and Decryption Technique (Caesar Cipher / Substitution Cipher)
10. Simple SDN Controller Simulation (Packet Forwarding Logic)

**TOTAL : 30 Periods****Total Periods : 45+30 =75 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1.Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022<br>2.James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.<br>3. William Stallings, Network Security Essentials: Applications and Standards, 6th Edition, Pearson Education, ISBN: 978-0134527338. |
| <b>Reference Books:</b>    | 1.William Stallings, "Data and Computer Communications", Pearson Education, Eleventh Edition, 2021.<br>2. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.<br>3. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.                                                    |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.coursera.org/">https://www.coursera.org/</a><br><a href="https://nptel.ac.in/">https://nptel.ac.in/</a><br><a href="https://www.edx.org/">https://www.edx.org/</a><br><a href="https://www.udemy.com/">https://www.udemy.com/</a><br><a href="https://www.netacad.com/">https://www.netacad.com/</a>                                                                            |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the fundamentals of data communication, network types, reference models, and switching techniques.                                             | Understand (K2)      |
| CO2                                                       | Explain the functions of the Data Link Layer and LAN technologies                                                                                         | Understand (K2)      |
| CO3                                                       | Apply addressing schemes and routing protocols at the Network Layer and interpret Transport Layer functions such as TCP/UDP, congestion control, and QoS. | Apply (K3)           |
| CO4                                                       | Analyze Application Layer protocols (DNS, FTP, HTTP, SMTP, SNMP) to evaluate their roles in enabling internet services.                                   | Analyze (K4)         |
| CO5                                                       | Evaluate emerging networking technologies by analyzing security concepts, encryption, firewalls, SDN, NFV, and 5G applications.                           | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | —   | —   | —   | —   | —   | —   | —   | —    | —    | 2    | 3    | 2    | —    |
| CO2         | 3   | 2   | —   | —   | —   | —   | —   | —   | —   | —    | —    | 2    | 3    | —    | —    |
| CO3         | 3   | 2   | 2   | 2   | —   | —   | —   | —   | —   | —    | —    | 3    | 3    | 2    | —    |
| CO4         | 3   | 2   | 3   | 2   | —   | —   | —   | —   | —   | —    | —    | 3    | 3    | 2    | —    |
| CO5         | 3   | —   | —   | —   | 2   | 2   | 2   | 2   | —   | —    | —    | 3    | 3    | 2    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

**I - Course Name: 23AD503 Deep Learning for Computer Vision**

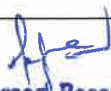
| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B.Tech. – IT | V   | PCC      | 3 | 0 | 2 | 4 |

**II - Course Objectives**

|   |                                                                                                                                              |
|---|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamental concepts of computer vision, including image formation and basic image processing techniques.                   |
| 2 | To equip students with techniques for feature extraction and image segmentation to enable meaningful interpretation of visual data.          |
| 3 | To provide practical exposure to machine learning and neural network algorithms used in computer vision tasks.                               |
| 4 | To develop analytical skills to handle 3D vision tasks such as stereo vision, motion estimation, and scene reconstruction.                   |
| 5 | To enable students to design and evaluate deep learning models for advanced vision applications like object detection and real-time systems. |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                    |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|
| <b>Preamble:</b> The Computer Vision course introduces core concepts of image formation, processing, and analysis. Students learn feature extraction, segmentation, and object recognition using classical and deep learning methods. The course covers 2D/3D vision tasks, motion analysis, and real-world applications like surveillance and autonomous driving. Emerging trends like vision transformers and self-supervised learning are also explored. |                                                    |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Introduction and Image Processing</b>           | <b>9 Periods</b> |
| Introduction to Computer Vision: Definition, Scope, Applications, Recent Trends-Basic Image Processing: Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Global optimization-Case Study: Preprocessing Satellite Images for Agricultural Analysis                                              |                                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Feature Extraction and Image Segmentation</b>   | <b>9 Periods</b> |
| Edge Detection: Canny Edge Detector-Corner Detection: Harris and Shi-Tomasi- Feature Matching Techniques and Applications (Object Tracking, AR)-Image Segmentation Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation Case Study: Automatic Crack Detection in Pavement Images                                                                                                                        |                                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Deep Learning for Computer Vision</b>           | <b>9 Periods</b> |
| CNN Basics and Architecture-Image Classification with CNN-Transfer Learning (VGG, ResNet)-Image Segmentation (Mask R-CNN, U-Net Overview)-Real-Time Applications: Gesture Recognition, OCR, Face Recognition -Case Study: Face Mask Detection using CNNs                                                                                                                                                                                                    |                                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>3D RECONSTRUCTION</b>                           | <b>9 Periods</b> |
| 3D Reconstruction: Shape from X - Active range finding - Surface representations - Point-based representations Volumetric representations - Model-based reconstruction - Recovering texture maps -Case Study: 3D Reconstruction of Indoor Scenes using SfM                                                                                                                                                                                                  |                                                    |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Advanced Vision Techniques and Applications</b> | <b>9 Periods</b> |
| Object Detection and Recognition: R-CNN, Fast R-CNN, YOLO, SSD, Face Detection & Recognition-Semantic and Instance Segmentation: SegNet-Video Processing and Action Recognition: Optical Flow in Video, Activity Recognition, Object Tracking in Videos-Recent Trends: Zero-shot and Few-shot Learning, Self-supervised Learning, Vision Transformers. Case Study: Autonomous Vehicle Perception using YOLO and Mask R-CNN                                  |                                                    |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

TOTAL : 45 Periods



**PRACTICAL EXERCISES:**

1. OpenCV Installation and Basic Image Operations (load, crop, resize, thresholding)
2. Image Annotation (drawing lines, text, shapes)
3. Image Enhancement (color spaces, histogram equalization, smoothing, edge detection)
4. Feature Detection and Matching (ORB, SIFT, SURF, feature alignment)
5. Image Segmentation (Graphcut / Grabcut methods)
6. Camera Calibration (circular grid method)
7. Pose Estimation
8. 3D Reconstruction from multiple views/stereo images
9. Creating Depth Map from Stereo Images
10. Object Detection and Tracking (Kalman Filter, Camshift)

**TOTAL : 30 Periods****Total Periods : 45+30 =75 Periods**

|                            |                                                                                                                                                                                                                                                                                                                          |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Texts in Computer Science, Second Edition, 2022.<br>2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.                                                                              |
| <b>Reference Books:</b>    | 1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.<br>2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006<br>3. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012. |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc25_cs143/preview">https://onlinecourses.nptel.ac.in/noc25_cs143/preview</a>                                                                                                                                                                                                |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                 | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain the fundamentals of computer vision, image formation, and basic image processing operations             | Understand (K2)      |
| CO2                                                       | Apply feature extraction and segmentation techniques to analyze and interpret image data                        | Apply (K3)           |
| CO3                                                       | Implement machine learning and neural network algorithms for visual recognition tasks                           | Apply (K3)           |
| CO4                                                       | Analyze 3D vision tasks such as stereo imaging, motion estimation, and structure from motion                    | Apply (K3)           |
| CO5                                                       | Develop and evaluate deep learning models for object detection, segmentation, and real-time vision applications | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 2   | 1   | 2   | 2   | -   | -   | 1   | 2   | 1    | 2    | 2    | 2    | 1    | 2    |
| CO2         | 2   | 2   | 2   | 2   | 2   | -   | -   | 1   | 2   | 1    | 2    | 2    | 2    | 2    | 2    |
| CO3         | 2   | 2   | 2   | 2   | 2   | -   | -   | 1   | 2   | 1    | 2    | 2    | 2    | 2    | 2    |
| CO4         | 2   | 2   | 2   | 2   | 2   | -   | -   | 1   | 2   | 1    | 2    | 2    | 2    | 2    | 2    |
| CO5         | 2   | 2   | 2   | 2   | 2   | -   | -   | 1   | 2   | 1    | 2    | 2    | 2    | 2    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23IT501 - Web Essentials

| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B.Tech. – IT | V   | PCC      | 3 | 0 | 2 | 4 |

## II - Course Objectives

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| 1 | To create responsive web pages using HTML, CSS, Bootstrap, and XML technologies.             |
| 2 | To develop dynamic and interactive web pages using JavaScript and AJAX.                      |
| 3 | To build and deploy Java-based web applications using Servlets, JSP, and session management. |
| 4 | To design server-side dynamic web content and handle user sessions using PHP.                |
| 5 | To connect web applications to databases and use modern web frameworks for development.      |

## III - Course Content

|                                                                                                                                                                                                                                                                                                        |                                                             |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------|
| <b>Preamble:</b> This course introduces web development fundamentals, covering HTML, CSS, JavaScript, and Bootstrap for responsive design. It explores client-side scripting, Angular and React basics, and concludes with building and deploying a React application through real-world case studies. |                                                             |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                        | <b>WEBSITE BASICS</b>                                       | <b>9 Periods</b> |
| HTML – Lists- Tables- Images- Forms- Media- Responsive Design- Bootstrap-CSS – Inline- Internal- External Style Sheets- Selectors- Box Model- Positioning- Flex/Grid Layouts-Transitions – Animations - XML – Document Type Definition (DTD)- XML Schemas- Document Object Model (DOM)                 |                                                             |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                       | <b>CLIENT SIDE SCRIPTING</b>                                | <b>9 Periods</b> |
| JavaScript – Syntax- Variables- Control Structures- Functions- Arrays- Events- Built-in Objects- Dynamic HTML- DOM Manipulation- Form Validation- Exception Handling- AJAX- JSON.                                                                                                                      |                                                             |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                      | <b>ANGULAR BASICS</b>                                       | <b>9 Periods</b> |
| Introduction to Angular- Angular Architecture Overview- Directives and Pipes-Forms in Angular-Services and Dependency Injection Conceptual Overview - Routing and Navigation Basic Usage                                                                                                               |                                                             |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                       | <b>INTRODUCTION TO REACT</b>                                | <b>9 Periods</b> |
| Introduction to React- React Components and JSX-State and Props-Event Handling - Conditional Rendering & Lists-Forms and Controlled Components - Lifecycle Methods (Class) - Hooks (useState, useEffect) - React Router Basics - Fetching Data from APIs                                               |                                                             |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                        | <b>BUILDING A REACT APPLICATION: PROJECT AND CASE STUDY</b> | <b>9 Periods</b> |
| Building a Mini React Application – Routing and Data Handling – Styling and Responsive Design – Best Practices – Deployment Overview – Real-world Case Study of a React Application (e.g., Instagram Web, GitHub UI) – Code Review and Project Presentation                                            |                                                             |                  |

TOTAL : 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**PRACTICAL EXERCISES:**

1. Creation of interactive web sites - Design using HTML and authoring tools
2. Form validation using JavaScript
3. Creation of simple React Hello world program
4. Handling multimedia content in web sites
5. Write programs using Servlets:
  - i. To invoke servlets from HTML forms
  - ii. Session tracking using hidden form fields and Session tracking for a hit count
6. Creation of information retrieval system using web, Django and MySQL
7. Creation of personal Information System
8. Mini Project: Interactive Website with All Components

**TOTAL: 30 Periods****Total Periods: 45+30 =75 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'Reilly, publishers, 2014.<br>2. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web – How to Program", 5th edition, Pearson Education, 2012.<br>3. Alex Banks and Eve Porcello, "Learning React: Modern Patterns for Developing React Apps", 3rd Edition, O'Reilly Media, 2023.            |
| <b>Reference Books:</b>    | 1. Jeffrey C. Jackson, "Web Technologies–A Computer Science Perspective", Pearson Education, 2006.<br>2. Valerio De Sanctis, "ASP.NET Core 6 and Angular", 5th Edition, Packt Publishing, 2022.<br>3. Fritz Schneider, Thomas Powell, "JavaScript – The Complete Reference", 3rd Edition, McGraw Hill Publishers, 2017.<br>5. Bates, "Developing Web Applications", Wiley Publishers, 2006. |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.w3schools.com/">https://www.w3schools.com/</a><br><a href="https://developer.mozilla.org/en-US/">https://developer.mozilla.org/en-US/</a><br><a href="https://reactjs.org/">https://reactjs.org/</a><br><a href="https://angular.io/start">https://angular.io/start</a><br><a href="https://getbootstrap.com/">https://getbootstrap.com/</a>                           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                         | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Design responsive and structured web pages using HTML, CSS, and Bootstrap.                              | Create (K6)          |
| CO2                                                       | Develop interactive client-side web applications using JavaScript, DOM, AJAX, and JSON.                 | Create (K6)          |
| CO3                                                       | Understand the foundational concepts of Angular including components, directives, and routing.          | Understand (K2)      |
| CO4                                                       | Build and manage dynamic React applications using components, props, state, hooks, and routing.         | Apply (K3)           |
| CO5                                                       | Plan, develop, and present a mini project using React and demonstrate real-world application use cases. | Create (K6)          |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 3   | 2   | 1   | 1   | 0   | 0   | 0   | 2    | 1    | 3    | 2    | 1    | 3    |
| CO2         | 3   | 3   | 3   | 2   | 1   | 0   | 0   | 0   | 0   | 2    | 0    | 3    | 2    | 1    | 3    |
| CO3         | 3   | 2   | 2   | 2   | 2   | 0   | 1   | 0   | 0   | 1    | 1    | 3    | 2    | 1    | 3    |
| CO4         | 3   | 2   | 3   | 2   | 2   | 0   | 1   | 0   | 0   | 1    | 1    | 3    | 2    | 1    | 3    |
| CO5         | 3   | 3   | 3   | 3   | 3   | 1   | 1   | 0   | 1   | 2    | 1    | 3    | 2    | 1    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

## I - Course Name: 23IT511 Summer Internship - I

| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B.Tech. – IT | V   | EEC      | 0 | 0 | 0 | 2 |

## II - Course Objectives

|   |                                                                                             |
|---|---------------------------------------------------------------------------------------------|
| 1 | Gain exposure to Information Technology based industries, research labs, and startups.      |
| 2 | Understand basic industry practices, workflows, tools, and professional ethics.             |
| 3 | Apply foundational knowledge of data analytics and machine learning to real-world problems. |
| 4 | Develop teamwork, communication, and problem-solving skills in a professional environment.  |
| 5 | Prepare structured technical documentation and presentations related to internship work.    |

## III - Guidelines

- Students shall undergo the internship only in approved companies/organizations relevant to their domain.
- A minimum duration of 4 weeks is mandatory; attendance must be certified by the industry mentor.
- Students shall submit an Internship Request/ Bonafide Letter approved by the principal through department before starting.
- Students shall complete the internship before the starting of the classes for VII Semester and may attend for 1 week after reopening with proper permission from the principal if required.
- Students shall strictly follow the company's code of conduct, working Periods, and confidentiality rules.
- Any change in internship location/duration must receive prior approval from the department.
- On completion, students must submit the following:
  - Completion certificate
  - Internship report
  - Presentation
- Evaluation will be based on industry feedback, report quality, viva-voce, and presentation.

TOTAL : 4 Weeks

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                     | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Identify IT industry practices, tools, technologies, and organizational processes.  | Understand (K2)      |
| CO2                                                       | Apply basic data preprocessing, analytics, and machine learning techniques.         | Apply (K3)           |
| CO3                                                       | Execute assigned tasks effectively by following professional and ethical practices. | Apply (K3)           |
| CO4                                                       | Demonstrate teamwork, communication, and time-management skills.                    | Analyze (K4)         |
| CO5                                                       | Prepare and present a well-structured internship report.                            | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 2   | -   | -   | 2   | -   | -   | -   | -   | -    | -    | 2    | 2    | 2    | -    |
| CO2         | 3   | 3   | 2   | 2   | 3   | -   | -   | -   | -   | -    | -    | -    | 3    | 2    | 2    |
| CO3         | 2   | 2   | 2   | -   | -   | 2   | 2   | 3   | 3   | 2    | -    | -    | -    | -    | -    |
| CO4         | -   | -   | -   | -   | -   | -   | -   | -   | 3   | 3    | -    | 2    | -    | -    | -    |
| CO5         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

**I - Course Name: 23IT601 – Full Stack Web Development**

| Prerequisite                        | Program Name | Sem | Category | L | T | P | C |
|-------------------------------------|--------------|-----|----------|---|---|---|---|
| Knowledge in 23IT501-Web Essentials | B.Tech. – IT | VI  | PCC      | 3 | 0 | 2 | 4 |

**II - Course Objectives**

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| 1 | To provide foundational knowledge of full stack web development and modern web architecture  |
| 2 | To enable students to build RESTful server-side applications using Python Flask              |
| 3 | To familiarize learners with database operations and data handling using MongoDB.            |
| 4 | To develop skills in creating dynamic and responsive front-end applications using Angular.   |
| 5 | To integrate, test, and deploy full stack applications following best development practices. |

**III - Course Content**

**Preamble:** This course introduces full stack web development for building complete web applications. It covers web architecture, RESTful backend development using Python Flask, front-end development using Angular, and database management using MongoDB. Students gain practical experience in developing, integrating, and testing full stack applications.

|                                                                                                                                                                                                                                                                                                                       |                                                   |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                       | <b>Fundamentals of Full Stack Web Development</b> | <b>9 Periods</b> |
| Overview of Full Stack Development – Client–Server Architecture – MVC and 3-Tier Architecture – Web Tools: Git, VS Code, npm, Postman (API testing) – Basics of Responsive Design using Bootstrap/Material UI – Overview of Full Stack Technologies – Introduction to MEAN, MERN, and Python-based stacks             |                                                   |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                      | <b>REST API Development using Python Flask</b>    | <b>9 Periods</b> |
| Introduction to Python for Web Development – Flask Framework Basics – REST API Design Concepts – Security and Protection – Data Management –Advanced Structure and Performance -Case Study: Backend Development Workflow – Testing and Containerization                                                               |                                                   |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                     | <b>Database Management</b>                        | <b>9 Periods</b> |
| Overview of Databases – Introduction to NoSQL Databases – MongoDB Basics – CRUD Operations – Data Modeling – Integrating MongoDB with Flask – Authentication and Access Control – Simple Data-Driven Applications                                                                                                     |                                                   |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                      | <b>Front-End Framework using Angular</b>          | <b>9 Periods</b> |
| Introduction to Angular – Core Fundamentals – Modern Angular Features (Angular 2025) – Application Services and Data Handling – Routing and Navigation– Forms Management – Reactive Forms – Template-Driven Forms                                                                                                     |                                                   |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                       | <b>Full Stack Code Integration</b>                | <b>9 Periods</b> |
| Integrating Front-End with Flask REST API (Angular)– Connecting Backend with Database– Authentication and Authorization Integration– API Testing with Postman – Error Handling and Best Practices– Case Study: Full Stack Application Development using Python Flask + Angular + MongoDB (or any equivalent database) |                                                   |                  |

**TOTAL : 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul -624401



**PRACTICAL EXERCISES:**

1. **Requirement Analysis & UI Design**  
Identify functional requirements of the mini project and design basic UI pages using HTML, CSS, and Bootstrap/Material UI.
2. **Database Design & Setup**  
Design the database schema and collections for users, accounts, and transactions using MongoDB.
3. **User Authentication Module**  
Implement user registration and login using Python and Flask, with session/JWT handling.
4. **Core Business Logic Module**  
Develop backend APIs for core operations (e.g., account details, balance enquiry, fund transfer) using Flask REST APIs.
5. **Front-End Integration**  
Build front-end components using Angular/React to consume Flask APIs and display dynamic data.
6. **Transaction / Record Management Module**  
Implement CRUD operations for transactions and history with proper validation and error handling.
7. **API Testing & Validation**  
Test all REST APIs using Postman and handle exceptions and error responses.
8. **Admin Module**  
Develop admin functionalities such as user management and report viewing.
9. **Security & Deployment Basics**  
Implement basic security features and demonstrate local deployment of the application.
10. **Integration, Demo & Documentation**  
Integrate all modules, prepare documentation, and demonstrate the complete mini project.

**TOTAL: 30 Periods****Total Periods: 45+30 =75 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018<br>2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.                                                                                                                                                                       |
| <b>Reference Books:</b>    | 1. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018<br>2. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018                                                                                                                  |
| <b>MOOC/Web Platforms:</b> | 1. <a href="https://www.tutorialspoint.com/the_full_stack_web_development/index.asp">https://www.tutorialspoint.com/the_full_stack_web_development/index.asp</a><br>2. <a href="https://www.coursera.org/specializations/full-stack-react">https://www.coursera.org/specializations/full-stack-react</a><br>3. <a href="https://www.udemy.com/course/the-full-stack-web-development/">https://www.udemy.com/course/the-full-stack-web-development/</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                         | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain the concepts of full stack development, web architecture, and essential tools.                  | Understand (K2)      |
| CO2                                                       | Develop RESTful server-side applications using Python Flask.                                            | Apply (K3)           |
| CO3                                                       | Perform CRUD operations and manage data using MongoDB.                                                  | Apply (K3)           |
| CO4                                                       | Design and develop dynamic and responsive front-end interfaces using Angular                            | Apply (K3)           |
| CO5                                                       | Integrate, test, deploy, and evaluate full stack applications using Python Flask, Angular, and MongoDB. | Create (K6)          |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 3   | 2   | 3   | 2   | -   | -   | 2   | 2    | 3    | 2    | 3    | 2    | 1    |
| CO2         | 3   | 2   | 3   | 3   | 3   | 2   | 1   | -   | -   | 2    | 2    | 2    | 3    | 3    | 2    |
| CO3         | 3   | 2   | 3   | 3   | 3   | 2   | 1   | 3   | 3   | 3    | 3    | 2    | 2    | -    | -    |
| CO4         | 3   | 2   | 3   | 3   | 3   | 3   | 1   | -   | -   | 1    | 2    | 2    | 3    | 3    | 2    |
| CO5         | 3   | 2   | 3   | 3   | 3   | 1   | -   | -   | -   | -    | 2    | 3    | 3    | 2    | 1    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## I - Course Name: 23CS902 - Distributed Computing

| Prerequisite | Program Name                       | Sem | Category | L | T | P | C |
|--------------|------------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E / B.Tech. – Common to CSE & IT | VI  | PCC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                           |
|---|---------------------------------------------------------------------------|
| 1 | Explain the foundation of distributed systems                             |
| 2 | Explain and apply advanced time synchronization technique                 |
| 3 | Apply advanced deadlock detection and prevention models                   |
| 4 | Explain and contrast various consensus algorithms under failure scenarios |
| 5 | Explain key components of modern cloud-native infrastructures             |

## III - Course Content

**Preamble:** Distributed Computing explores systems in which multiple interconnected computers collaborate to solve complex problems efficiently. It focuses on resource sharing, scalability, fault tolerance, and coordination to deliver high-performance, reliable computing solutions.

|                                                                                                                                                                                                                                                                                                                                                                                                 |                                              |                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                 | <b>INTRODUCTION ON DISTRIBUTED COMPUTING</b> | <b>10 Periods</b> |
| Introduction: Definition-Relation to Computer System Components – Motivation – Message – Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks |                                              |                   |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>LOGICAL TIME AND MESSAGE ORDERING</b>     | <b>8 Periods</b>  |
| Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks— Scalar Time – Vector Time; Message Ordering: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Snapshot Algorithms for FIFO Channels                                                                      |                                              |                   |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                               | <b>DISTRIBUTED MUTEX AND DEADLOCK</b>        | <b>9 Periods</b>  |
| Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport’s algorithm – Ricart Agrawala’s Algorithm — Token-Based Algorithms – Suzuki-Kasami’s Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm for the AND model and OR Model                             |                                              |                   |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>CONSENSUS AND RECOVERY</b>                | <b>9 Periods</b>  |
| Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System (Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Check pointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery                                                     |                                              |                   |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                 | <b>CLOUD COMPUTING</b>                       | <b>9 Periods</b>  |
| Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization on – Load Balancing – Scalability and Elasticity – Replica on – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services                                                      |                                              |                   |

TOTAL : 45 Periods

|                            |                                                                                                                                                                                                                                                                        |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1.Kshemkalyani Ajay D, Mukesh Singhal, "Distributed Computing: Principles, Algorithms and Systems", Cambridge Press, 2011.<br>2.Mukesh Singhal, Niranjana G Shivaratri, "Advanced Concepts in Operating systems", McGraw Hill Publishers, 1994.                        |
| <b>Reference Books:</b>    | 1. George Coulouris- Jean Dollimore- Time Kindberg- "Distributed Systems Concepts and Design"- Fifth Edition- Pearson Education- 2012.<br>2. Andrew S. Tanenbaum, Maarten van Steen, "Distributed Systems Principles and Paradigms", 2nd ed., Pearson Education, 2010. |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/106106107">https://nptel.ac.in/courses/106106107</a>                                                                                                                                                                              |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain core concepts of distributed systems and their models.            | Understanding (K2)   |
| <b>CO2</b>                                                | Analyze time coordination and global state in distributed systems.        | Analyzing (K4)       |
| <b>CO3</b>                                                | Apply distributed algorithms for mutual exclusion and deadlock detection. | Applying (K3)        |
| <b>CO4</b>                                                | Evaluate agreement algorithms and recovery mechanisms.                    | Evaluate (K5)        |
| <b>CO5</b>                                                | Explore and utilize cloud computing technologies, models, and services.   | Applying (K3)        |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | 2   | 1   | 2   | -   | -   | -   | -   | 2    | -    | 1    | 3    | 2    | 3    |
| <b>CO2</b>  | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | -   | 2    | -    | 2    | 3    | 2    | 3    |
| <b>CO3</b>  | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -   | 2    | -    | 2    | 3    | 3    | 3    |
| <b>CO4</b>  | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -   | 2    | -    | 2    | 3    | 3    | 3    |
| <b>CO5</b>  | 3   | 2   | 2   | 2   | 3   | 2   | 2   | 2   | 2   | 2    | 1    | 3    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23CS903 – Embedded Systems and IoT

| Prerequisite | Program Name                              | Sem | Category | L | T | P | C |
|--------------|-------------------------------------------|-----|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT and AI&DS | VI  | PCC      | 3 | 0 | 2 | 4 |

## II - Course Objectives

|   |                                                                                                                                    |
|---|------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To provide foundational knowledge of embedded systems, microcontroller architecture, and instruction sets.                         |
| 2 | To introduce the ARM Cortex processor and its peripheral programming for real-time applications.                                   |
| 3 | To develop hands-on skills in Arduino and Raspberry Pi programming for IoT applications.                                           |
| 4 | To explore various IoT communication protocols such as BLE, ZigBee, LoRa, and their implementation.                                |
| 5 | To enable students to design and prototype IoT-based solutions for domains like healthcare, smart agriculture, and home automation |

## III - Course Content

**Preamble:** This course introduces the basics of Embedded Systems and IoT, focusing on microcontroller architecture and programming. It covers platforms like 8051, ARM Cortex, Arduino, and Raspberry Pi with hands-on interfacing techniques. Students will apply these concepts to develop real-time applications in domains like healthcare, agriculture, and smart cities.

|                                                                                                                                                                                                                                                                                                                                                                                                           |                                                             |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                           | <b>INTRODUCTION TO EMBEDDED SYSTEMS AND MICROCONTROLLER</b> | <b>9 Periods</b> |
| Introduction to Embedded Systems –Structural units in Embedded processor - selection of processor – Overview of 8/16 bit Microprocessors – Microcontroller for an Embedded System- 8051 Microcontroller – Architecture, Addressing Modes, Instruction Set- Memory Interfacing of 8051 – Stacks – Interrupts – Timers/Counters – Serial Ports – Programming.                                               |                                                             |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                          | <b>ARM PROCESSOR</b>                                        | <b>9 Periods</b> |
| ARM Processor – Instruction Set Preliminaries – CPU – Programming Input and Output –Supervisor Mode – Exceptions and Trap – Models for programs – Assembly, Linking and Loading – Compilation Techniques – Program Level Performance Analysis.                                                                                                                                                            |                                                             |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                         | <b>ARDUINO PROGRAMMING</b>                                  | <b>9 Periods</b> |
| Introduction to the Arduino, Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches - Using the Arduino IDE – Arduino Shield - Integration of Sensors and Actuators with Arduino.                                                                                                                                                                                                |                                                             |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                          | <b>IOT COMMUNICATION</b>                                    | <b>9 Periods</b> |
| Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components- Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations - Communications, RFID and NFC (Near - Field Communication), Bluetooth, WiFi, LiFi, 6LowPAN, ZigBee, Raspberry Pi – Architecture – Programming – Interfacing – Connecting to the Cloud. |                                                             |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                           | <b>EMBEDDED SYSTEM AND IOT APPLICATIONS</b>                 | <b>9 Periods</b> |
| Embedded System Design Process – Development of IoT Applications – Home Automation –Smart Agriculture – Smart Cities –Health care monitoring systems, Model Train Controller.                                                                                                                                                                                                                             |                                                             |                  |

TOTAL : 45 Periods

**PRACTICAL EXERCISES:****Experiments using 8051**

1. Programming Arithmetic and Logical Operations in 8051.
2. Programming using On-Chip ports in 8051.
3. Programming using Serial Ports in 8051.

**Experiments using Processors**

4. Introduction to Arduino platform and programming
5. Exploring Communication with IoT Devices Using Bluetooth
6. Introduction to Raspberry PI platform
7. Setup a cloud platform to log the data
8. Setting up an IoT device for cloud-based data logging
9. Interfacing ADC and DAC using ARM
10. Interfacing keyboard using ARM

**TOTAL: 30 Periods****Total Periods: 45+30 =75 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051</li> <li>2. Microcontroller and Embedded Systems", Pearson Education, Second Edition, 2014</li> <li>Marilyn Wolf, "Computers as Components – Principles of Embedded Computing System Design", 3rd Edition, Morgan Kaufmann, 2012.</li> </ol>                                                                                                                                                                                                                                                                                            |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Adesh Kumar, Surajit Mondal, Gaurav Verma, and Prashant Mani, "Embedded Devices</li> <li>2. and Internet of Things" , 1st Edition, CRC Press, Boca Raton, Florida, 2024.</li> <li>Arshdeep Bahga, Vijay Madisetti, —Internet of Things - A hands-on approach    , UniversitiesPress, 2015</li> <li>3. The 8051 Microcontroller and Embedded Systems by Kenneth J. Ayala, 2nd Edition, 2004, Cengage Learning.</li> <li>4. Raj Kamal, 'Embedded System-Architecture, Programming, Design', Mc Graw Hill, 2013.</li> <li>5. Lyla B.Das, Embedded Systems: An Integrated Approach, Pearson Education, 2013</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <ul style="list-style-type: none"> <li>• <a href="https://onlinecourses.nptel.ac.in/noc20_cs14/preview">https://onlinecourses.nptel.ac.in/noc20_cs14/preview</a> Embedded Systems Design, Prof. Anupam Basu, IIT Kharagpur</li> <li>• <a href="https://onlinecourses.nptel.ac.in/noc22_cs53/preview">https://onlinecourses.nptel.ac.in/noc22_cs53/preview</a> Introduction To Internet Of Things, Prof. Sudip Misra, IIT Kharagpur</li> </ul>                                                                                                                                                                                                                |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                            | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain the architecture and features of 8051.                                                                                             | Understand (K 2)     |
| CO2                                                       | Apply ARM processor architecture and programming concepts.                                                                                 | Apply (K3)           |
| CO3                                                       | Develop Arduino-based IoT applications using sensors, actuators, and communication interfaces                                              | Apply (K3)           |
| CO4                                                       | Use IoT communication protocols with Raspberry Pi for device connectivity and cloud integration.                                           | Apply (K3)           |
| CO5                                                       | Design and evaluate real-time embedded and IoT-based solutions for smart agriculture, healthcare, smart cities, and industrial automation. | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | 2    | 2    | 3    | 3    | 3    |
| CO2         | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | 2    | 2    | 3    | 3    | 3    |
| CO3         | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | 2    | 2    | 3    | 3    | 3    |
| CO4         | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | 2    | 2    | 3    | 3    | 3    |
| CO5         | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | 2    | 2    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## I - Course Name: 23IT611 – Mini Project

| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B.Tech. IT   | VI  | EEC      | 0 | 0 | 4 | 2 |

## II - Course Objectives

|   |                                                                              |
|---|------------------------------------------------------------------------------|
| 1 | To gain knowledge for identifying real-world problems.                       |
| 2 | To develop skills to find the solutions for real-world problems.             |
| 3 | To develop skills for documentation and presentation of identified solution. |

## III - Instructions

1. Mini project should be completed within the scheduled semester timeline.
2. Students must work in the assigned team size (usually 2–4 members).
3. Project topic must be approved by the Project Coordinator and HoD.
4. The project must be simple, innovative, and based on basic principles learned in the course.
5. Students should attend all review meetings, provide progress updates, and implement mentor feedback.
6. Plagiarism is not permitted; students must submit original work.
7. Final submission must include:
  - Mini project report
  - Working model/demo
  - Presentation slides
8. Marks will be based on problem definition, methodology, execution, teamwork, documentation, and viva.

TOTAL : 60 Periods



## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Apply theoretical knowledge gained from coursework to solve a practical engineering problem. | Apply (K3)           |
| CO2                                                       | Design and implement a system, model, prototype, or software relevant to the chosen project. | Apply (K3)           |
| CO3                                                       | Maintain proper project documentation, including reports and references.                     | Understand (K2)      |
| CO4                                                       | Demonstrate professional ethics, originality, and adherence to academic standards.           | Apply (K3)           |
| CO5                                                       | Develop teamwork, documentation, presentation, and basic project management skills.          | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 3   | 3   | 3    | 2    | 2    | 3    | 2    | 2    |
| CO2         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 3   | 3   | 3    | 2    | 2    | 3    | 2    | 2    |
| CO3         | -   | -   | -   | -   | -   | -   | -   | 3   | 3   | 3    | 2    | 2    | -    | -    | -    |
| CO4         | -   | -   | -   | -   | -   | -   | -   | 3   | 3   | 3    | -    | -    | -    | -    | -    |
| CO5         | -   | -   | -   | -   | -   | -   | -   | 3   | 3   | 3    | 3    | 3    | 3    | 3    | 1    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

## I - Course Name: 23GE902 - Human Values and Ethics

| Prerequisite | Program Name                          | Sem     | Category | L | T | P | C |
|--------------|---------------------------------------|---------|----------|---|---|---|---|
| Nil          | B.E./B.TECH. – Common to All Branches | III/VII | HSMC     | 2 | 0 | 0 | 2 |

## II - Course Objectives

|   |                                                                                                                                                                               |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand core democratic values and their role in citizen participation.                                                                                                 |
| 2 | To understand secular values and their importance in promoting acceptance and non-discrimination in a diverse society.                                                        |
| 3 | To understand the concept of secularism in the Indian context and its role in promoting acceptance of all faiths and non-discriminatory practices.                            |
| 4 | To apply ethical reasoning to social issues like gender bias, violence, and discrimination, while understanding constitutional protections and promoting inclusive practices. |
| 5 | To understand and apply professional ethics, including integrity, respect for authority, confidentiality, and the rights of employees and employers, in the workplace.        |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                     |                                     |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------|
| <b>Preamble:</b> This course aims to provide a broad understanding of the modern values and ethical principles that have evolved and are enshrined in the Constitution of India concerning the democratic, secular, and scientific aspects. The course is designed for undergraduate students so that they can study, understand, and apply these values in their day-to-day lives. |                                     |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                     | <b>DEMOCRATIC VALUES</b>            | <b>6 Periods</b> |
| Understanding Democratic values: Equality, Liberty, Fraternity, Freedom, Justice, Pluralism, Tolerance, Respect for All, Freedom of Expression, Citizen Participation in the Governance-Indian Freedom Movement.                                                                                                                                                                    |                                     |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                    | <b>SECULAR VALUES</b>               | <b>6 Periods</b> |
| Understanding Secular values – Interpretation of secularism in the Indian context - Disassociation of state from religion – Acceptance of all faiths – Encouraging non-discriminatory practices.                                                                                                                                                                                    |                                     |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                   | <b>SCIENTIFIC VALUES AND ETHICS</b> | <b>6 Periods</b> |
| Scientific thinking and method: Inductive and Deductive thinking, Proposing and testing Hypothesis, validating facts using an evidence-based approach. Transparency and Fairness in scientific pursuits – Scientific inventions for the betterment of society - Unfair application of scientific inventions.                                                                        |                                     |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                    | <b>SOCIAL ETHICS</b>                | <b>6 Periods</b> |
| Application of ethical reasoning to social problems – Gender bias and issues – Gender violence – Social discrimination – Constitutional protection and policies – Inclusive practices.                                                                                                                                                                                              |                                     |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                     | <b>PROFESSIONAL ETHICS</b>          | <b>6 Periods</b> |
| Plagiarism - Dishonesty - Stealing - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination, Values, and standards that both employees and employers - Code of ethics in the workplace.                                                              |                                     |                  |

TOTAL : 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Reading Text: Excerpts from John Stuart Mills on Liberty.<br>2. Reading Text: Excerpt from Secularism in India: Concept and Practice by Ram Puniyani.<br>3. Reading Text: Excerpt from The Scientific Temper by Antony Michaelis R.<br>4. Reading Text: Excerpt from 21 Lessons for the 21st Century by Yuval Noah Harari.                                                                                                                                                                                                                              |
| <b>Reference Books:</b>    | 1. The Nonreligious: Understanding Secular People and Societies, Luke W. Galen Oxford University Press, 2016.<br>2. Secularism: A Dictionary of Atheism, Bullivant, Stephen; Lee, Lois, Oxford University Press, 2016.<br>3. The Oxford Handbook of Secularism, John R. Shook, Oxford University Press, 2017.<br>4. The Civic Culture: Political Attitudes and Democracy in Five Nations by Gabriel A. Almond and Sidney Verba, Princeton University Press,<br>5. Research Methodology for Natural Sciences by Soumitro Banerjee, IISc Press, January 2022 |
| <b>MOOC/Web Platforms:</b> | <ul style="list-style-type: none"> <li>• www.onlineethics.org</li> <li>• www.nspe.org</li> <li>• www.globalethics.org</li> <li>• www.ethics.org</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                 |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain how democratic values like equality, liberty, and justice enhance governance and citizen participation.                                    | Understand (BL 2)    |
| <b>CO2</b>                                                | Apply secular values to ensure acceptance of all faiths and non-discrimination.                                                                    | Apply (BL 3)         |
| <b>CO3</b>                                                | Apply scientific thinking and methods to assess and promote transparency, fairness, and ethical use of scientific inventions for societal benefit. | Apply (BL 3)         |
| <b>CO4</b>                                                | Explain how ethical reasoning applies to social issues and constitutional protections.                                                             | Understand (BL 2)    |
| <b>CO5</b>                                                | Apply professional ethics to address issues such as honesty, confidentiality, and conflicts of interest in the workplace.                          | Apply (BL 3)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | -   | -   | -   | -   | -   | 1   | 2   | 3   | 1   | 2    | -    | 2    | -    | -    | -    |
| <b>CO2</b>  | -   | -   | -   | -   | -   | 1   | 2   | 3   | 1   | 2    | -    | 2    | -    | -    | -    |
| <b>CO3</b>  | -   | -   | -   | -   | -   | 1   | 2   | 3   | 1   | 2    | -    | 2    | -    | -    | -    |
| <b>CO4</b>  | -   | -   | -   | -   | -   | 1   | 2   | 3   | 1   | 2    | -    | 2    | -    | -    | -    |
| <b>CO5</b>  | -   | -   | -   | -   | -   | 1   | 2   | 3   | 1   | 2    | -    | 3    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

**I - Course Name: 23IT701 – Mobile App Development**

| Prerequisite                                                                           | Program Name | Sem | Category | L | T | P | C |
|----------------------------------------------------------------------------------------|--------------|-----|----------|---|---|---|---|
| Knowledge in<br>23CS402 –Database Management<br>Systems<br>23CS501 – Computer Networks | B.Tech. IT   | VII | PCC      | 3 | 0 | 2 | 4 |

**II - Course Objectives**

|   |                                                                                                           |
|---|-----------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamentals of mobile platforms and hybrid mobile application development.              |
| 2 | To enable students to design and develop cross-platform user interfaces using                             |
| 3 | modern hybrid frameworks.                                                                                 |
| 4 | To familiarize students with common tools for developing, testing, and deploying apps on Android and iOS. |
| 5 | To equip students with skills to integrate APIs, databases, and device features in                        |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                      |                                                      |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------|
| <b>Preamble:</b> This course introduces the basics of Embedded Systems and IoT, focusing on microcontroller architecture and programming. It covers platforms like 8051, ARM Cortex, Arduino, and Raspberry Pi with hands-on interfacing techniques. Students will apply these concepts to develop real-time applications in domains like healthcare, agriculture, and smart cities. |                                                      |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                      | <b>INTRODUCTION TO MOBILE AND HYBRID DEVELOPMENT</b> | <b>9 Periods</b> |
| Mobile application overview – Native vs Hybrid vs Web apps – Advantages of hybrid approach – Overview of Android and iOS platforms – Introduction to hybrid frameworks (Flutter, React Native, Ionic) – Development environment setup – Creating first hybrid app.                                                                                                                   |                                                      |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                     | <b>UI/UX DESIGN FOR CROSS-PLATFORM APPS</b>          | <b>9 Periods</b> |
| UI principles – Responsive layouts – Widgets/components in hybrid frameworks – Navigation and routing – Theming and styling – Forms and user input – Accessibility and usability.                                                                                                                                                                                                    |                                                      |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                    | <b>APPLICATION LOGIC AND STATE MANAGEMENT</b>        | <b>9 Periods</b> |
| Application architecture – State management concepts – Handling user interactions – Lifecycle management – Modular design – Error handling and debugging.                                                                                                                                                                                                                            |                                                      |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                     | <b>DATA, APIS AND DEVICE FEATURES</b>                | <b>9 Periods</b> |
| Working with REST APIs – JSON parsing – Local storage options – Database integration – Accessing device features (camera, GPS, sensors) – Notifications – Permissions.                                                                                                                                                                                                               |                                                      |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                      | <b>TESTING, DEPLOYMENT AND TOOLS</b>                 | <b>9 Periods</b> |
| Testing hybrid apps – Debugging tools – Performance optimization – Build and deployment for Android and iOS – App stores overview – Version control – CI/CD basics.                                                                                                                                                                                                                  |                                                      |                  |

**TOTAL : 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**PRACTICAL EXERCISES:**

1. Develop and demonstrate a simple cross-platform test mobile application using a hybrid framework.
2. Design responsive UI screens and implement navigation.
3. Integrate a public REST API and display data in the app.
4. Implement local data storage and basic CRUD operations.
5. Access at least one device feature such as GPS or camera.
6. Apply notifications and permissions in the application.
7. Mini Project: Develop a real-world hybrid mobile application and present it at the end of the semester.

**TOTAL: 30 Periods****Total Periods: 45+30 =75 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Bill Phillips, Chris Stewart, Kristin Marsicano, "Android Programming: The Big Nerd Ranch Guide", Fourth Edition, Big Nerd Ranch, 2019.</li> <li>2. Google Developers, "Android Studio 4.2 Edition", Official Google Training.</li> <li>3. Neil Smyth, "Android Studio 4.2 / 2021 Development Essentials", Payload Media, 4.2 Edition</li> </ol>                                           |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Paul Deitel &amp; Harvey Deitel, Android for Programmers: An App-Driven Approach, Second Edition", Deitel Series.</li> <li>2. Adam Gerber &amp; Clifton Craig, "Learn Android Studio: Build Android Apps Using the Official IDE", Apress, First Edition.</li> <li>3. Ian F. Darwin, "Android Cookbook", O'Reilly (Third Edition) – Covers practical recipes for modern Android.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <ul style="list-style-type: none"> <li>• <a href="https://developer.android.com">https://developer.android.com</a></li> <li>• <a href="https://www.coursera.org">https://www.coursera.org</a></li> <li>• <a href="https://www.udacity.com">https://www.udacity.com</a></li> <li>• <a href="https://www.udemy.com">https://www.udemy.com</a></li> </ul>                                                                               |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                            | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand mobile platforms and hybrid application architecture.           | Understand (K2)      |
| CO2                                                       | Design and develop cross-platform mobile applications using frameworks.    | Apply (K3)           |
| CO3                                                       | Integrate APIs, databases, and device features in mobile apps.             | Analyze (K4)         |
| CO4                                                       | Apply UI/UX principles to build user-friendly applications.                | Analyze (K4)         |
| CO5                                                       | Build, test, and deploy a complete hybrid mobile application as a project. | Create (K6)          |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | -   | -   | 1   | -   | -   | -   | 1   | -    | 1    | 1    | 2    | 1    | 1    |
| CO2         | 3   | 2   | 1   | 3   | -   | -   | -   | -   | -   | 1    | 2    | 2    | 3    | 2    | 1    |
| CO3         | 3   | 3   | 2   | 3   | -   | -   | -   | -   | -   | -    | 1    | 2    | 3    | 2    | 1    |
| CO4         | 2   | 2   | 3   | 0   | 2   | -   | -   | 2   | 2   | 2    | 2    | 3    | 3    | 3    | 2    |
| CO5         | 3   | 3   | 3   | 2   | 3   | -   | -   | 2   | 2   | 2    | 2    | 3    | 3    | 3    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23IT711 – Summer Internship - II**

| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B.Tech. IT   | VII | EEC      | 0 | 0 | 0 | 2 |

**II - Course Objectives**

|   |                                                                                                           |
|---|-----------------------------------------------------------------------------------------------------------|
| 1 | Gain advanced professional exposure in IT industries, research organizations, or academia.                |
| 2 | Analyze complex, real-world problems using programming, data analytics, AI, and emerging IT technologies. |
| 3 | Design and implement end-to-end IT solutions using modern tools and platforms.                            |
| 4 | Understand automation, deployment, MLOps, and ethical considerations in IT systems.                       |
| 5 | Enhance technical reporting, presentation, and leadership skills.                                         |

**III - Guidelines**

- Students shall undergo the internship only in approved companies/organizations relevant to their domain.
- A minimum duration of 4 weeks is mandatory; attendance must be certified by the industry mentor.
- Students shall submit an Internship Request/ Bonafide Letter approved by the principal through department before starting.
- Students shall complete the internship before the starting of the classes for VII Semester and may attend for 1 week after reopening with proper permission from the principal if required.
- Students shall strictly follow the company's code of conduct, working Periods, and confidentiality rules.
- Any change in internship location/duration must receive prior approval from the department.
- On completion, students must submit the following:
  - Completion certificate
  - Internship report
  - Presentation
- Evaluation will be based on industry feedback, report quality, viva-voce, and presentation.

**TOTAL : 4 Weeks**

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand IT industry processes, emerging technologies, and best practices.     | Understand (K2)      |
| CO2                                                       | Design suitable application solutions for complex business problems.             | Apply (K3)           |
| CO3                                                       | Build, test, deploy, and optimize software models on target platforms.           | Apply (K3)           |
| CO4                                                       | Apply professional, ethical, and collaborative practices in real-world projects. | Apply (K3)           |
| CO5                                                       | Prepare comprehensive technical reports and deliver effective presentations.     | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 2   | -   | -   | 2   | -   | -   | -   | -   | -    | -    | 2    | 2    | 2    | -    |
| CO2         | 3   | 3   | -   | -   | 3   | -   | -   | -   | -   | -    | -    | -    | 3    | 3    | 2    |
| CO3         | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -   | -    | -    | -    | 3    | 3    | 3    |
| CO4         | -   | -   | 3   | 3   | -   | 2   | 2   | 3   | 3   | 2    | -    | -    | -    | -    | -    |
| CO5         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23IT712 – Research Paper Writing and Publications

| Prerequisite | Program Name | Sem | Category | L | T | P | C |
|--------------|--------------|-----|----------|---|---|---|---|
| Nil          | B.Tech. IT   | VII | EEC      | 0 | 0 | 2 | 1 |

## II - Course Objectives

|   |                                                                                                                             |
|---|-----------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce students to research fundamentals and help them formulate clear research problems and objectives.              |
| 2 | To develop skills in performing effective literature reviews using scholarly databases.                                     |
| 3 | To train students in writing research components such as abstracts, introductions, methodology, and results                 |
| 4 | To ensure students understand plagiarism, citation styles, and proper referencing for academic writing.                     |
| 5 | To enable students to prepare, format, and present a complete research paper suitable for journal or conference submission. |

## III – Course Content

**Preamble:** This course introduces the essential skills required for academic research and technical writing. It guides students through problem identification, literature review, structured writing, and preparing research papers for publication.

| Exp. No. | Experiment Title                       | Description / Tasks                                                                                                                                                                                                                        |
|----------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | Understanding Research Basics          | <ul style="list-style-type: none"> <li>Identify a research problem in IT.</li> <li>Perform literature review using Google Scholar, IEEE Xplore, ACM DL.</li> <li>Prepare a summary table (author, year, method, findings, gap).</li> </ul> |
| 2        | Problem Statement & Objectives Writing | <ul style="list-style-type: none"> <li>Write a clear problem statement.</li> <li>Frame objectives and research questions.</li> <li>Prepare scope and significance.</li> </ul>                                                              |
| 3        | Research Methodology Documentation     | <ul style="list-style-type: none"> <li>Select appropriate research methodology.</li> <li>Prepare data collection and analysis plan.</li> <li>Create methodology flowchart/diagram.</li> </ul>                                              |
| 4        | Plagiarism Checking & Avoidance        | <ul style="list-style-type: none"> <li>Use tools: Turnitin/Grammarly/Quetext.</li> <li>Practice paraphrasing and citation.</li> <li>Produce a plagiarism-free paragraph.</li> </ul>                                                        |
| 5        | Referencing & Citation Styles          | <ul style="list-style-type: none"> <li>Use Google Scholar, Zotero, Mendeley.</li> <li>Practice APA/IEEE/MLA styles.</li> <li>Create a bibliography.</li> </ul>                                                                             |
| 6        | Writing the Research Abstract          | <ul style="list-style-type: none"> <li>Prepare structured abstract (Background–Method–Results– Conclusion).</li> <li>Peer review and refine.</li> </ul>                                                                                    |
| 7        | Introduction Section Writing           | <ul style="list-style-type: none"> <li>Write Background, Gap, Motivation, Contributions.</li> <li>Compare with IEEE/Elsevier style.</li> </ul>                                                                                             |
| 8        | Methodology & Results Section Writing  | <ul style="list-style-type: none"> <li>Draft methodology for a mini-project.</li> <li>Create tables/graphs.</li> <li>Interpret results in 5–6 lines.</li> </ul>                                                                            |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

| Exp. No. | Experiment Title                            | Description / Tasks                                                                                                                                                                           |
|----------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9        | Preparing Figures, Tables & Graphs          | <ul style="list-style-type: none"> <li>Learn academic visual rules.</li> <li>Create 2 tables, 2 graphs, and 1 flowchart.</li> </ul>                                                           |
| 10       | Applying Templates for Research Paper       | <ul style="list-style-type: none"> <li>Use IEEE/Elsevier/Springer templates.</li> <li>Format title, abstract, sections, references.</li> </ul>                                                |
| 11       | Checking Paper Quality Metrics              | <ul style="list-style-type: none"> <li>Perform grammar, readability, and citation accuracy check.</li> <li>Ensure formatting compliance.</li> </ul>                                           |
| 12       | Preparing for Journal/Conference Submission | <ul style="list-style-type: none"> <li>Choose journal/conference (IEEE/Scopus/UGC).</li> <li>Check submission guidelines.</li> <li>Prepare manuscript, cover letter, declarations.</li> </ul> |
| 13       | Presentation of Research Work               | <ul style="list-style-type: none"> <li>Prepare PPT (Problem, Review, Method, Results, Conclusion).</li> <li>Present 10–12 slides.</li> </ul>                                                  |
| 14       | Mini Research Paper Writing                 | <ul style="list-style-type: none"> <li>Create a 4–6 page paper individually/pair.</li> <li>Submit final paper in IEEE format.</li> </ul>                                                      |

TOTAL : 30 Periods

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Identify and define a real-world problem and develop an appropriate technical solution.                                | Apply (K3)           |
| CO2                                                       | Identify, analyze, and define a real-world problem and formulate appropriate technical solutions.                      | Analyze (K4)         |
| CO3                                                       | Design and develop a small-scale system, model, or application using relevant tools and technologies.                  | Analyze (K4)         |
| CO4                                                       | Enhance skills in literature survey, problem modeling, implementation, and testing.                                    | Apply (K3)           |
| CO5                                                       | Present and defend the project effectively through reports, presentations, and viva-voce, meeting evaluation criteria. | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | -   | -   | 1   | -   | -   | -   | 1   | -    | 1    | 2    | 2    | 1    | 1    |
| CO2         | 3   | 2   | 1   | 1   | 3   | -   | -   | -   | -   | 1    | 2    | 2    | 3    | 2    | 1    |
| CO3         | 3   | 3   | 2   | 2   | 3   | -   | -   | -   | -   | -    | 1    | 2    | 3    | 2    | 1    |
| CO4         | 2   | 2   | 3   | 0   | 2   | -   | -   | 1   | 2   | 1    | 2    | 2    | 2    | 2    | 1    |
| CO5         | 3   | 3   | 3   | 2   | 3   | -   | -   | 2   | 2   | 2    | 2    | 3    | 3    | 3    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23IT811 – Project Work

| Prerequisite | Program Name | Sem  | Category | L | T | P  | C  |
|--------------|--------------|------|----------|---|---|----|----|
| Nil          | B.Tech. IT   | VIII | EEC      | 0 | 0 | 20 | 10 |

## II - Course Objectives

|   |                                                                                                                |
|---|----------------------------------------------------------------------------------------------------------------|
| 1 | To enable students to undertake research-oriented or application-oriented projects with measurable outcomes.   |
| 2 | To provide guidance in selecting relevant project topics aligned with the academic program and industry needs. |
| 3 | To develop skills in systematic planning, execution, and review of projects as per institutional timelines.    |
| 4 | To promote ethical practices, proper documentation, and avoidance of plagiarism in project work.               |
| 5 | To enhance students' ability to design, implement, and present technical solutions effectively.                |

## III - Guidelines

9. Project work shall be research-oriented or application-oriented with measurable outcomes.
10. Students shall choose a project relevant to their program with Project coordinator and HoD approval.
11. Project teams shall strictly follow the institutional project timeline and attend all scheduled reviews.
12. Students shall maintain a project logbook with weekly progress signed by the Supervisor.
13. Any external project collaboration shall be supported by an MoU or permission letter from the principal through department.
14. Students shall adhere to ethical practices, avoid plagiarism, and ensure proper citation of references.
15. Final submission includes:
  - Project report as per approved format
  - System design/model/prototype/source code
  - Publication in IEEE/Scopus indexed conferences and journals
  - Final presentation
16. Evaluation will be based on innovation, technical depth, implementation, documentation, and viva-voce.

TOTAL : 300 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Identify and define a real-world problem and develop an appropriate technical solution.                                | Apply (K3)           |
| CO2                                                       | Identify, analyze, and define a real-world problem and formulate appropriate technical solutions.                      | Analyze (K4)         |
| CO3                                                       | Design and develop a small-scale system, model, or application using relevant tools and technologies.                  | Analyze (K4)         |
| CO4                                                       | Enhance skills in literature survey, problem modeling, implementation, and testing.                                    | Apply (K3)           |
| CO5                                                       | Present and defend the project effectively through reports, presentations, and viva-voce, meeting evaluation criteria. | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 3   | 3   | 3    | 3    | 3    | 3    | 3    | 2    |
| CO2         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 3   | 3   | 3    | 3    | 3    | 3    | 3    | 2    |
| CO3         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 3   | 3   | 3    | 2    | 2    | -    | 2    | 1    |
| CO4         | 3   | 3   | 3   | 2   | 2   | 2   | 2   | 3   | 3   | 3    | -    | -    | -    | -    | -    |
| CO5         | -   | -   | -   | -   | -   | -   | -   | 3   | 3   | 3    | 3    | 3    | 3    | 3    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**XI - Elective - Management Courses****I - Course Name: 23GE701 Principles of Management**

| Prerequisite | Programme Name             | Sem | Category | L | T | P | C |
|--------------|----------------------------|-----|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to All | VII | HSMC     | 3 | 0 | 0 | 3 |

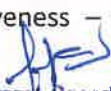
**II - Course Objectives**

|   |                                                                                                   |
|---|---------------------------------------------------------------------------------------------------|
| 1 | To familiarize students with modern management concepts, functions, and organizational practices. |
| 2 | To understand managerial roles and responsibilities essential for technical environments.         |
| 3 | To explore fundamental HR processes and workplace behaviour.                                      |
| 4 | To apply contemporary management theories to engineering and business settings.                   |
| 5 | To relate individual and organizational goals for effective managerial decision-making.           |

**III - Course Content****Preamble:**

This course introduces engineering students to the fundamentals of managerial practices, organizational processes, and human behaviour at work. It highlights the importance of planning, organizing, directing, and controlling, and equips learners with essential management skills required for effective communication, leadership, and teamwork in technical and business environments.

| Unit - I                                                                                                                                                                                                                                                                                                                                                                                                                                  | BASICS OF MANAGEMENT & ORGANIZATIONAL FORMS | 9 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------|
| Meaning and importance of management – Management as a science, art, and professional practice – Roles, skills, and competencies of modern managers – Evolution of management thought: Scientific, Behavioural, Systems, Contingency and Contemporary approaches – Types of business organizations: Proprietorship, Partnership, Corporations, Start-ups – Organizational culture, environment, and emerging global trends in management. |                                             |           |
| Unit - II                                                                                                                                                                                                                                                                                                                                                                                                                                 | MANAGERIAL PLANNING & DECISION STRATEGIES   | 9 Periods |
| Purpose and significance of planning – Planning hierarchy – Types of plans: Strategic, Tactical, Operational – Setting goals and policies – Planning assumptions – Strategic management basics – Planning and forecasting tools – Decision making: stages, techniques, and analytical approaches used in engineering and business settings.                                                                                               |                                             |           |
| Unit - III                                                                                                                                                                                                                                                                                                                                                                                                                                | ORGANIZING & HUMAN RESOURCE PROCESSES       | 9 Periods |
| Purpose of organizing – Formal and informal structures – Organization charts – Types of organization structures: Line, Functional, Matrix, Hybrid – Authority and responsibility relationships – Departmentation – Delegation and decentralization – Job design elements – Overview of HRM: Human resource planning, recruitment and selection, training and development, performance appraisal, employee career development.             |                                             |           |
| Unit - IV                                                                                                                                                                                                                                                                                                                                                                                                                                 | LEADING PEOPLE & WORKPLACE BEHAVIOUR        | 9 Periods |
| Fundamentals of individual and group behaviour – Motivation theories and techniques – Job satisfaction and employee involvement – Leadership styles and modern leadership approaches – Communication process and barriers – Improving communication effectiveness – Digital and technology-enabled communication at workplace.                                                                                                            |                                             |           |

  
Chairperson, Board of Studies.

| Unit - V                                                                                                                                                                                                                                                                                                                                   | CONTROL SYSTEMS & PERFORMANCE MANAGEMENT | 9 Periods |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------|
| Nature and importance of control – Types of control systems: Pre-control, Concurrent, Post-control – Budgetary and non-budgetary methods – Role of IT and analytics in organizational control – Productivity measurement and improvement – Managerial reporting and performance monitoring – Corrective and preventive control mechanisms. |                                          |           |

**TOTAL: 45 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Harold Koontz and Heinz Weihrich "Essentials of management" Tata McGraw Hill, 1998.<br>2. Stephen P. Robbins and Mary Coulter, " Management", Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.                                                                                                                                                                                                  |
| <b>Reference Books:</b>    | 1. Robert Kreitner and Mamata Mohapatra, " Management", Biztantra, 2008.<br>2. Stephen A. Robbins and David A. Decenzo and Mary Coulter, "Fundamentals of Management" Pearson Education, 7th Edition, 2011.<br>3. Tripathy PC and Reddy PN, "Principles of Management", Tata McGraw Hill, 1999.                                                                                                        |
| <b>MOOC/Web Platforms:</b> | 1. <a href="https://nptel.ac.in/courses/110/105/110105121/">https://nptel.ac.in/courses/110/105/110105121/</a><br>2. <a href="https://www.coursera.org/learn/principles-of-management">https://www.coursera.org/learn/principles-of-management</a><br>3. <a href="https://www.edx.org/learn/management/introduction-to-management">https://www.edx.org/learn/management/introduction-to-management</a> |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the fundamental concepts, roles, and approaches of modern management. | Understand (K2)      |
| <b>CO2</b>                                                | Apply planning and decision-making techniques in managerial situations.       | Apply (K3)           |
| <b>CO3</b>                                                | Demonstrate understanding of organizational design and HR processes.          | Apply (K3)           |
| <b>CO4</b>                                                | Analyze employee behaviour, leadership styles, and communication practices.   | Analyze (K4)         |
| <b>CO5</b>                                                | Assess control systems and performance measures used in organizations.        | Analyze (K4)         |

**V - Mapping Table - Mapping of COs with POs and PSOs**

| COs Vs POs/ PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO 2 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|-------|-------|------|-------|
| CO1              | 3   | -   | --  | -   | -   | 1   | -   | -   | -   | -     | -     | -     | 1    | -     |
| CO2              | -   | 1   | 1   | -   | -   | -   | -   | -   | -   | -     | -     | -     | 1    | -     |
| CO3              | 1   | -   | -   | 2   | -   | -   | 1   | -   | 2   | -     | 1     | 1     | 1    | -     |
| CO4              | -   | 1   | 1   | 1   | 2   | -   | -   | 1   | 2   | -     | -     | -     | 1    | -     |
| CO5              | 1   | -   | -   | -   | 1   | 1   | -   | -   | -   | 3     | 1     | 1     | 1    | -     |

Mapping: 1-Low, 2-Medium, 3-High

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23GE702 Total Quality Management**

| Prerequisite | Programme Name             | Sem | Category | L | T | P | C |
|--------------|----------------------------|-----|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to All | VII | HSMC     | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                                          |
|---|------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To know the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM. |
| 2 | To explain the TQM Principles for applications.                                                                                          |
| 3 | To define the basics of traditional tools, new tools, benchmarking and FMEA.                                                             |
| 4 | To know about Taguchi's quality loss function and performance measures.                                                                  |
| 5 | To apply QMS and EMS in any organization.                                                                                                |

**III - Course Content****Preamble:**

This course provides the fundamental concepts, principles, and tools of Total Quality Management needed for improving organizational performance. It equips students with practical knowledge of quality tools, Six Sigma, QFD, TPM, and international standards like ISO 9001 and ISO 14001. The course enables learners to apply quality systems effectively in industrial environments.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------|
| <b>Unit - I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>FOUNDATIONS OF QUALITY &amp; TQM</b>  | <b>9 Periods</b> |
| Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Definition of TQM - Basic concepts of TQM - Gurus of TQM (Brief introduction) - TQM Framework- Barriers to TQM - Benefits of TQM.                                                                                                                                                                                                                                                                               |                                          |                  |
| <b>Unit - II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>PRINCIPLES &amp; PRACTICES OF TQM</b> | <b>9 Periods</b> |
| Leadership - Deming Philosophy, Quality Council, Quality statements and Strategic planning- Customer Satisfaction - Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal - Continuous process improvement - Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating and Relationship development. |                                          |                  |
| <b>Unit - III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>QUALITY IMPROVEMENT TOOLS - I</b>     | <b>9 Periods</b> |
| The seven traditional tools of quality - New management tools - Six-sigma Process Capability- Bench marking - Reasons to benchmark, Benchmarking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfalls and Criticisms of Benchmarking - FMEA - Intent , Documentation, Stages: Design FMEA and Process FMEA.                                                                                                                                       |                                          |                  |
| <b>Unit - IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>QUALITY IMPROVEMENT TOOLS - II</b>    | <b>9 Periods</b> |
| Quality circles - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures- Cost of Quality - BPR.                                                                                                                                                                                                                                                                                                                                                                       |                                          |                  |

Chairperson-Board of Studies,

Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

| Unit - V                                                                                                                                                                                                                                                                                                                                                                   | QUALITY SYSTEMS & INTERNATIONAL STANDARDS | 9 Periods |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------|
| Introduction-Benefits of ISO Registration - ISO 9000 Series of Standards-Sector Specific Standards - AS 9100, TS16949 and TL 9000 - ISO 9001 Requirements Implementation - Documentation-Internal Audits - Registration - Environmental Management System: Introduction - ISO 14000 Series Standards - Concepts of ISO 1400 - Requirements of ISO 14001 - Benefits of EMS. |                                           |           |

TOTAL: 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Dale H. Besterfield et al., "Total Quality Management", Pearson Education, 3rd Edition.<br>2. S. Balasubramanian, "Total Quality Management", PHI Learning.<br>3. K. Shridhara Bhat, "Total Quality Management", Himalaya Publishing House.                                                                                                               |
| <b>Reference Books:</b>    | 1. Joel E. Ross, "Total Quality Management: Text, Cases and Readings", CRC Press.<br>2. Poornima M. Charantimath, "Total Quality Management", Pearson.<br>3. Amitava Mitra, "Fundamentals of Quality Control and Improvement", Wiley.                                                                                                                        |
| <b>MOOC/Web Platforms:</b> | 1. <a href="https://www.coursera.org/learn/six-sigma-principles">https://www.coursera.org/learn/six-sigma-principles</a><br>2. <a href="https://nptel.ac.in/courses/112/105/112105305/">https://nptel.ac.in/courses/112/105/112105305/</a><br>3. <a href="https://nptel.ac.in/courses/110/106/110106149/">https://nptel.ac.in/courses/110/106/110106149/</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                   | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Apply TQM concepts in a selected enterprise.                                                      | Apply (K3)           |
| CO2                                                       | Apply TQM principles in a selected enterprise.                                                    | Apply (K3)           |
| CO3                                                       | Understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.               | Understand (K2)      |
| CO4                                                       | Understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR. | Understand (K2)      |
| CO5                                                       | Apply QMS and EMS in any organization.                                                            | Apply (K3)           |

## V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs POs/ PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO 2 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|-------|-------|------|-------|
| CO1              | 3   | 2   | 2   | 2   | 1   | 1   | -   | 1   | 2   | 1     | 1     | 2     | 1    | -     |
| CO2              | 3   | 3   | 3   | 2   | 1   | 1   | -   | 1   | 2   | 2     | 1     | 2     | 1    | -     |
| CO3              | 2   | 2   | 2   | 2   | 1   | 1   | -   | 1   | 2   | 1     | 1     | 2     | 1    | -     |
| CO4              | 2   | 2   | 2   | 2   | 1   | 1   | -   | 1   | 2   | 1     | 1     | 2     | 1    | -     |
| CO5              | 3   | 2   | 2   | 2   | 1   | 1   | -   | 1   | 2   | 2     | 1     | 3     | 1    | -     |

Mapping: 1-Low, 2-Medium, 3-High



**I - Course Name: 23GE703 Engineering Economics and Financial Accounting**

| Prerequisite | Programme Name             | Sem | Category | L | T | P | C |
|--------------|----------------------------|-----|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to All | VII | HSMC     | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                |
|---|----------------------------------------------------------------|
| 1 | To understand the concept of engineering economics.            |
| 2 | To know the various micro economics concept in real life.      |
| 3 | To understand the different procedures of pricing.             |
| 4 | To gain knowledge in the field of macroeconomics.              |
| 5 | To learn the various cost related concepts in micro economics. |

**III - Course Content****Preamble:**

This course introduces the fundamental concepts of engineering economics and financial accounting required for effective decision-making in engineering projects. It helps students understand demand, cost, pricing, financial statements, and capital budgeting. The course enables learners to evaluate economic feasibility and apply financial principles in real-time industrial situations.

|                                                                                                                                                                                                                                                                                                                                   |                                                    |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|
| <b>Unit - I</b>                                                                                                                                                                                                                                                                                                                   | <b>DEMAND &amp; SUPPLY ANALYSIS</b>                | <b>9 Periods</b> |
| Managerial Economics - Relationship with other disciplines - Firms: Types, objectives and goals - Managerial decisions - Decision analysis. Demand - Types of demand - Determinants of demand - Demand function - Demand elasticity - Demand forecasting - Supply - Determinants of supply - Supply function - Supply elasticity. |                                                    |                  |
| <b>Unit - II</b>                                                                                                                                                                                                                                                                                                                  | <b>PRODUCTION AND COST ANALYSIS</b>                | <b>9 Periods</b> |
| Production function - Returns to scale - Production optimization - Least cost input - Isoquants - Managerial uses of production function. Cost Concepts - Cost function - Determinants of cost - Short run and Long run cost curves - Cost Output Decision - Estimation of Cost.                                                  |                                                    |                  |
| <b>Unit - III</b>                                                                                                                                                                                                                                                                                                                 | <b>PRICING</b>                                     | <b>9 Periods</b> |
| Determinants of Price - Pricing under different objectives and different market structures - Price discrimination - Pricing methods in practice.                                                                                                                                                                                  |                                                    |                  |
| <b>Unit - IV</b>                                                                                                                                                                                                                                                                                                                  | <b>FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT)</b> | <b>9 Periods</b> |
| Balance sheet and related concepts - Profit & Loss Statement and related concepts - Financial Ratio Analysis - Cash flow analysis - Funds flow analysis - Comparative financial statements - Analysis & Interpretation of financial statements.                                                                                   |                                                    |                  |
| <b>Unit - V</b>                                                                                                                                                                                                                                                                                                                   | <b>CAPITAL BUDGETING (ELEMENTARY TREATMENT)</b>    | <b>9 Periods</b> |
| Investments - Risks and return evaluation of investment decision - Average rate of return - Payback Period - Net Present Value - Internal rate of return.                                                                                                                                                                         |                                                    |                  |

**TOTAL: 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001<br>2. Managerial Economics: Analysis, Problems and Cases - P. L. Mehta, Edition, 13. Publisher, Sultan Chand, 2007.                                                                                                                                                                                                                                                                       |
| <b>Reference Books:</b>    | 1. Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2011.<br>2. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2010.<br>3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, "Engineering Economy", Macmillan, New 224 York, 2011.<br>4. Zahid A khan: Engineering Economy, "Engineering Economy", Dorling Kindersley, 2012<br>5. Dr. S. N. Maheswari and Dr. S.K. Maheshwari: Financial Accounting, Vikas, 2009 |
| <b>MOOC/Web Platforms:</b> | 1. <a href="https://www.edx.org/learn/accounting/financial-accounting">https://www.edx.org/learn/accounting/financial-accounting</a><br>2. <a href="https://www.coursera.org/learn/microeconomics-principles">https://www.coursera.org/learn/microeconomics-principles</a><br>3. <a href="https://nptel.ac.in/courses/110/105/110105054/">https://nptel.ac.in/courses/110/105/110105054/</a>                                                                                         |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                       | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Apply the basics of economics and cost analysis to engineering and take economically sound decisions. | Apply (K3)           |
| <b>CO2</b>                                                | Analyze the economic theories, cost concepts and pricing policies.                                    | Analyze (K4)         |
| <b>CO3</b>                                                | Understand the market structures and integration concepts.                                            | Understand (K2)      |
| <b>CO4</b>                                                | Understand the measures of national income, the functions of banks and concepts of globalization.     | Understand (K2)      |
| <b>CO5</b>                                                | Apply the concepts of financial management for project appraisal.                                     | Apply (K3)           |

## V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs<br>POs/<br>PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO 2 |
|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|-------|-------|------|-------|
| <b>CO1</b>             | 3   | 3   | 2   | 3   | 2   | 1   | -   | 1   | 2   | 2     | 2     | 3     | 1    | -     |
| <b>CO2</b>             | 3   | 3   | 3   | 3   | 2   | 1   | -   | 1   | 2   | 2     | 2     | 3     | 1    | -     |
| <b>CO3</b>             | 2   | 2   | 2   | 2   | 1   | 1   | -   | 1   | 2   | 1     | 1     | 2     | 1    | -     |
| <b>CO4</b>             | 2   | 2   | 2   | 2   | 1   | 1   | -   | 1   | 2   | 1     | 1     | 2     | 1    | -     |
| <b>CO5</b>             | 3   | 3   | 3   | 3   | 2   | 1   | -   | 1   | 2   | 2     | 2     | 3     | 1    | -     |

Mapping: 1-Low, 2-Medium, 3-High

Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23GE704 Human Resource Management**

| Prerequisite | Programme Name             | Sem | Category | L | T | P | C |
|--------------|----------------------------|-----|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to All | VII | HSMC     | 3 | 0 | 0 | 3 |

**II - Course Objectives**

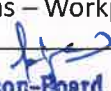
|   |                                                                                      |
|---|--------------------------------------------------------------------------------------|
| 1 | To know the fundamentals of Human Resource Management and its role in organizations. |
| 2 | To learn the processes involved in manpower planning, recruitment, and selection.    |
| 3 | To gain knowledge on training, skill development, and employee capability building.  |
| 4 | To be familiarize with compensation systems and employee motivation.                 |
| 5 | To know the performance management, employee relations, and workplace issues.        |

**III - Course Content****Preamble:**

This course introduces the essential concepts and practices of Human Resource Management, focusing on manpower planning, training, compensation, and performance management. The syllabus is designed to help engineering students understand how HR practices support organizational productivity and employee development. It also highlights modern HR trends relevant to technology-driven workplaces.

|                                                                                                                                                                                                           |                                                  |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------|
| <b>Unit - I</b>                                                                                                                                                                                           | <b>INTRODUCTION TO HUMAN RESOURCE MANAGEMENT</b> | <b>9 Periods</b> |
| Role and importance of human resources – Scope and functions of HRM – HR policies – HR manager's responsibilities – Modern HR challenges in technology-driven organizations                               |                                                  |                  |
| <b>Unit - II</b>                                                                                                                                                                                          | <b>HUMAN RESOURCE PLANNING</b>                   | <b>9 Periods</b> |
| Need for HR planning – Manpower forecasting – Job analysis and job description – Sources of human resources – Recruitment methods (traditional & digital) – Selection process – Orientation & onboarding. |                                                  |                  |
| <b>Unit - III</b>                                                                                                                                                                                         | <b>TRAINING AND EXECUTIVE DEVELOPMENT</b>        | <b>9 Periods</b> |
| Concept of training – Types of training (technical, soft skills, safety, induction) – Executive development – E-learning & digital training tools – Training evaluation (basics).                         |                                                  |                  |
| <b>Unit - IV</b>                                                                                                                                                                                          | <b>EMPLOYEE COMPENSATION</b>                     | <b>9 Periods</b> |
| Components of compensation – Incentives, rewards & recognition – Employee motivation basics – Career planning and career development – Mentoring and coaching in modern workplaces                        |                                                  |                  |
| <b>Unit - V</b>                                                                                                                                                                                           | <b>PERFORMANCE EVALUATION AND CONTROL</b>        | <b>9 Periods</b> |
| Performance appraisal methods – Feedback mechanisms – Key performance indicators (KPIs) – Grievances and redressal approaches – Basics of employee relations – Workplace discipline.                      |                                                  |                  |

**TOTAL: 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Decenzo and Robbins, "Human Resource Management", 8th Edition, Wiley, 2007.<br>2. John Bernardin. H., "Human Resource Management – An Experimental Approach", 5th Edition, Tata McGraw Hill, 2013, New Delhi.                                                                                                                                                                                     |
| <b>Reference Books:</b>    | 1. Luis R., Gomez-Mejia, DavidB. Balkin and Robert L. Cardy, "Managing Human Resources", 7th Edition, PHI, 2012.<br>2. Dessler, "Human Resource Management", Pearson Education Limited, 2007.                                                                                                                                                                                                        |
| <b>MOOC/Web Platforms:</b> | 1. <a href="https://nptel.ac.in/courses/110/105/110105054/">https://nptel.ac.in/courses/110/105/110105054/</a><br>2. <a href="https://www.coursera.org/specializations/human-resource-management">https://www.coursera.org/specializations/human-resource-management</a><br>3. <a href="https://www.edx.org/learn/human-resource-management">https://www.edx.org/learn/human-resource-management</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                       | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain the fundamental concepts, roles, and functions of Human Resource Management in organizations                  | Understand (K2)      |
| CO2                                                       | Describe the processes of human resource planning, recruitment, selection, and onboarding.                            | Understand (K2)      |
| CO3                                                       | Apply appropriate training and skill development methods suitable for technical and organizational needs.             | Apply (K3)           |
| CO4                                                       | Analyze compensation systems, reward mechanisms, and career development practices.                                    | Analyze (K4)         |
| CO5                                                       | Analyze performance management approaches and propose solutions for handling grievances and employee relations issues | Analyze (K4)         |

## V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs<br>POs/<br>PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO<br>10 | PO<br>11 | PO<br>12 | PSO1 | PSO<br>2 |
|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|----------|----------|------|----------|
| CO1                    | 3   | 2   | 1   | 1   | 1   | 1   | -   | 1   | 2   | 1        | 1        | 2        | 1    | -        |
| CO2                    | 3   | 3   | 2   | 2   | 1   | 1   | -   | 1   | 2   | 1        | 1        | 2        | 1    | -        |
| CO3                    | 3   | 3   | 3   | 2   | 1   | 1   | -   | 1   | 2   | 1        | 1        | 3        | 1    | -        |
| CO4                    | 2   | 3   | 3   | 2   | 1   | 1   | -   | 1   | 2   | 1        | 1        | 3        | 1    | -        |
| CO5                    | 2   | 2   | 1   | 1   | 1   | 1   | -   | 1   | 2   | 1        | 1        | 2        | 1    | -        |

Mapping: 1-Low, 2-Medium, 3-High

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23GE705 Knowledge Management**

| Prerequisite | Programme Name             | Sem | Category | L | T | P | C |
|--------------|----------------------------|-----|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to All | VII | HSMC     | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                             |
|---|-----------------------------------------------------------------------------|
| 1 | To learn the evolution of Knowledge management.                             |
| 2 | To be familiar with creating the culture of learning and knowledge sharing. |
| 3 | To be familiar knowledge management tools.                                  |
| 4 | To be exposed to knowledge management applications.                         |
| 5 | To be familiar with future trends and case studies.                         |

**III - Course Content**

**Preamble:** This course introduces the foundations, tools, and applications of Knowledge Management, enabling learners to understand how organizations create, share, and utilize knowledge. It also equips students with skills to use KM technologies and develop KM strategies aligned with organizational goals.

|                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                               |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------|
| <b>Unit - I</b>                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>INTRODUCTION</b>                                           | <b>9 Periods</b> |
| Introduction: An Introduction to Knowledge Management - The foundations of knowledge management- including cultural issues- technology applications organizational concepts and processes- management aspects- and decision support systems. The Evolution of Knowledge management: From Information Management to Knowledge Management - Key Challenges Facing the Evolution of Knowledge Management Ethics for Knowledge Management. |                                                               |                  |
| <b>Unit - II</b>                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>CREATING THE CULTURE OF LEARNING AND KNOWLEDGE SHARING</b> | <b>9 Periods</b> |
| Organization and Knowledge Management - Building the Learning Organization. Knowledge Markets: Cooperation among Distributed Technical Specialists – Tacit Knowledge and Quality Assurance.                                                                                                                                                                                                                                            |                                                               |                  |
| <b>Unit - III</b>                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>KNOWLEDGE MANAGEMENT-THE TOOLS</b>                         | <b>9 Periods</b> |
| Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management - Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval - Information Coding in the Internet Environment - Repackaging Information.                                                                                        |                                                               |                  |
| <b>Unit - IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>KNOWLEDGE MANAGEMENT APPLICATION</b>                       | <b>9 Periods</b> |
| Components of a Knowledge Strategy - Case Studies (From Library to Knowledge Center, Knowledge Management in the Health Sciences, Knowledge Management in Developing Countries).                                                                                                                                                                                                                                                       |                                                               |                  |
| <b>Unit - V</b>                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>FUTURE TRENDS AND CASE STUDIES</b>                         | <b>9 Periods</b> |
| Advanced topics and case studies in knowledge management - Development of a knowledge management map/plan that is integrated with an organization's strategic and business plan - A case study on Corporate Memories for supporting various aspects in the process life -cycles of an organization.                                                                                                                                    |                                                               |                  |

Chairperson Board of Studies,

Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul, 624401

TOTAL: 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Srikantaiah, T.K., Koenig, M., "Knowledge Management for the Information Professional" Information Today, Inc., 2000                                                                                                                                                                                                                                                                                                  |
| <b>Reference Books:</b>    | 1. Nonaka, I., Takeuchi, H., "The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation", Oxford University Press, 1995.                                                                                                                                                                                                                                                                  |
| <b>MOOC/Web Platforms:</b> | 1. <a href="https://nptel.ac.in/courses/110/105/110105139/">https://nptel.ac.in/courses/110/105/110105139/</a><br>2. <a href="https://www.udemy.com/course/knowledge-management-fundamentals/">https://www.udemy.com/course/knowledge-management-fundamentals/</a><br>3. <a href="https://www.futurelearn.com/courses/digital-knowledge-management">https://www.futurelearn.com/courses/digital-knowledge-management</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------|----------------------|
| <b>C01</b>                                                | Understand the process of acquire knowledge from experts. | Understand (K2)      |
| <b>C02</b>                                                | Understand the learning organization.                     | Understand (K2)      |
| <b>C03</b>                                                | Use the knowledge management tools.                       | Apply (K3)           |
| <b>C04</b>                                                | Develop knowledge management applications.                | Apply (K3)           |
| <b>C05</b>                                                | Apply knowledge management for future trends.             | Apply (K3)           |

## V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs<br>POs/<br>PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>C01</b>             | 3   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 2   | 1    | 1    | 1    | 1    | -    |
| <b>C02</b>             | 2   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 3   | 1    | 1    | 1    | 1    | -    |
| <b>C03</b>             | 2   | 3   | 3   | 2   | 2   | 1   | 1   | 1   | 2   | 2    | 1    | 1    | 1    | -    |
| <b>C04</b>             | 3   | 3   | 3   | 3   | 2   | 1   | 1   | 1   | 2   | 2    | 1    | 2    | 1    | -    |
| <b>C05</b>             | 3   | 3   | 3   | 3   | 3   | 1   | 1   | 1   | 2   | 3    | 2    | 2    | 1    | -    |

Mapping: 1-Low, 2-Medium, 3-High

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23GE706 Industrial Management**

| Prerequisite | Programme Name             | Sem | Category | L | T | P | C |
|--------------|----------------------------|-----|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to All | VII | HSMC     | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                             |
|---|-------------------------------------------------------------------------------------------------------------|
| 1 | To study the basic concepts of management and approaches to management.                                     |
| 2 | To study the planning; organizing and staffing functions of management in professional organization.        |
| 3 | To study the leading; controlling and decision making functions of management in professional organization. |
| 4 | To learn the organizational theory in professional organization.                                            |
| 5 | To learn the principles of productivity and modern concepts in management in professional organization.     |

**III - Course Content**

**Preamble:** This course introduces the principles and functions of management essential for industrial settings. It equips students with knowledge of planning, organizing, leading, and controlling, along with modern management concepts used in engineering and industrial environments

|                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------------------|
| <b>Unit - I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>INTRODUCTION TO MANAGEMENT</b>     | <b>9 Periods</b> |
| Management: Introduction; Definition and Functions – Approaches to the study of Management – Mintzberg's Ten Managerial Roles – Principles of Taylor; Fayol; Weber; Parker – Forms of Organization: Sole Proprietorship; Partnership; Company (Private and Public); Cooperative – Public Sector Vs Private Sector Organization – Business Environment: Economic; Social; Political; Legal – Trade Union: Definition; Functions; Merits & Demerits. |                                       |                  |
| <b>Unit - II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>FUNCTIONS OF MANAGEMENT - I</b>    | <b>9 Periods</b> |
| Planning: Characteristics; Nature; Importance; Steps; Limitation; Planning Premises; Strategic Planning; Vision & Mission statement in Planning– Organizing: Organizing Theory; Principles; Types; Departmentalization; Centralization and Decentralization; Authority & Responsibility – Staffing: Systems Approach; Recruiting and Selection Process; Human Resource Development (HRD) Concept and Design.                                       |                                       |                  |
| <b>Unit - III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>FUNCTIONS OF MANAGEMENT - II</b>   | <b>9 Periods</b> |
| Directing (Leading): Leadership Traits; Style; Morale; Managerial Grids (Blake-Mouton, Reddin) – Communication: Purpose; Model; Barriers – Controlling: Process; Types; Levels; Guidelines; Audit (External, Internal, Merits); Preventive Control – Decision Making: Elements; Characteristics; Nature; Process; Classifications.                                                                                                                 |                                       |                  |
| <b>Unit - IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>ORGANIZATION THEORY</b>            | <b>9 Periods</b> |
| Organizational Conflict: Positive Aspects; Individual; Role; Interpersonal; Intra Group; Inter Group; Conflict Management – Maslow's hierarchy of needs theory; Herzberg's motivation-hygiene theory; McClelland's three needs motivation theory; Vroom's valence-expectancy theory – Change Management: Concept of Change; Lewin's Process of Change Model; Sources of Resistance; Overcoming Resistance; Guidelines to managing Conflict.        |                                       |                  |
| <b>Unit - V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>PRODUCTIVITY AND MODERN TOPICS</b> | <b>9 Periods</b> |

Productivity: Concept; Measurements; Affecting Factors; Methods to Improve – Modern Topics (concept, feature/characteristics, procedure, merits and demerits): Business Process Reengineering (BPR); Benchmarking; SWOT/SWOC Analysis; Total Productive Maintenance; Enterprise Resource Planning (ERP); Management of Information Systems (MIS).

**TOTAL: 45 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. M. Govindarajan and S. Natarajan, "Principles of Management", Prentice Hall of India, New Delhi, 2009.<br>2. Koontz. H. and Weihrich. H., "Essentials of Management: An International Perspective", 8th Edition, Tata McGrawhill, New Delhi, 2010.                                                                                                                                                                                                                                      |
| <b>Reference Books:</b>    | 1. Joseph J, Massie, "Essentials of Management", 4th Edition, Pearson Education, 1987.<br>2. Saxena, P. K., "Principles of Management: A Modern Approach", Global India Publications, 2009.<br>3. S.Chandran, "Organizational Behaviours", Vikas Publishing House Pvt. Ltd., 1994.<br>4. Richard L. Daft, "Organization Theory and Design", South Western College Publishing, 11th Edition, 2012.<br>5. S. Trevis Certo, "Modern Management Concepts and Skills", Pearson Education, 2018. |
| <b>MOOC/Web Platforms:</b> | 1. <a href="https://nptel.ac.in/courses/110/107/110107146/">https://nptel.ac.in/courses/110/107/110107146/</a><br>2. <a href="https://www.coursera.org/learn/foundations-of-management">https://www.coursera.org/learn/foundations-of-management</a><br>3. <a href="https://www.edx.org/learn/management">https://www.edx.org/learn/management</a>                                                                                                                                         |

#### IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                          | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the basic concepts of management and approaches to management.                                | Understand (K2)      |
| CO2                                                       | Apply the planning; organizing and staffing functions of management in professional organization.        | Apply (K3)           |
| CO3                                                       | Apply the leading; controlling and decision making functions of management in professional organization. | Apply (K3)           |
| CO4                                                       | Apply the organizational theory in professional organization.                                            | Apply (K3)           |
| CO5                                                       | Apply the principles of productivity and modern concepts in management in professional organization.     | Apply (K3)           |

#### V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs POs/ PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO 2 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|-------|-------|------|-------|
| CO1              | 3   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 2   | 2     | 1     | 1     | 1    | -     |
| CO2              | 3   | 2   | 2   | 1   | 1   | 1   | 1   | 1   | 2   | 2     | 1     | 1     | 1    | -     |
| CO3              | 3   | 3   | 2   | 2   | 2   | 1   | 1   | 1   | 3   | 2     | 1     | 2     | 1    | -     |
| CO4              | 3   | 3   | 2   | 2   | 2   | 1   | 1   | 1   | 3   | 3     | 2     | 2     | 1    | -     |
| CO5              | 3   | 3   | 3   | 2   | 3   | 1   | 1   | 1   | 3   | 3     | 2     | 2     | 1    | -     |

Mapping: 1-Low, 2-Medium, 3-High



**XII - Elective - Mandatory Courses****I - Course Name: 23MC901 - English for Communication**

| Prerequisite | Programme Name            | Sem | Category | L | T | P | C |
|--------------|---------------------------|-----|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | -   | MC       | 3 | 0 | 0 | 0 |

**II - Course Objectives**

|    |                                                                                                                          |
|----|--------------------------------------------------------------------------------------------------------------------------|
| 1. | To improve the four essential skills of mastering the English language: Listening, Speaking, Reading, and Writing (LSRW) |
| 2. | To enhance students' confidence and fluency in communicating effectively in academic and professional contexts.          |
| 3. | To develop vocabulary, pronunciation, and grammatical accuracy.                                                          |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                           |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <b>Preamble:</b>                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                           |                  |
| The course English for Communication is designed to equip students with essential language skills required for effective communication in academic, professional, and social contexts. Emphasizing practical usage, the course focuses on developing proficiency in speaking, listening, reading, and writing. |                                                                                                                                                                                                                           |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                | <b>Effective Listening</b>                                                                                                                                                                                                | <b>9 Periods</b> |
| Active Listening: Techniques and Importance-Reasons for Poor Listening-Traits of a Good Listener-Listening Modes and Types-Barriers to Listening-Listening Practice: General vs. Specific Listening                                                                                                            |                                                                                                                                                                                                                           |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                               | <b>Effective Speaking</b>                                                                                                                                                                                                 | <b>9 Periods</b> |
| Basics of English Speech Sounds-Word and Sentence Stress-Intonation Patterns-Introducing Self and Others                                                                                                                                                                                                       |                                                                                                                                                                                                                           |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                              | <b>Effective Communication</b>                                                                                                                                                                                            | <b>9 Periods</b> |
| Building Confidence and Fluency-Vocal Cues: Tone, Pitch, Rate of Speech-Telephone Etiquette and Real-life Conversations-Dialogue Writing                                                                                                                                                                       |                                                                                                                                                                                                                           |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                               | <b>Effective Reading</b>                                                                                                                                                                                                  | <b>9 Periods</b> |
| Reading for Gist and Specific Information-Techniques: Skimming, Scanning, Predicting-SQ3R Reading Method-Study Skills for Comprehension                                                                                                                                                                        |                                                                                                                                                                                                                           |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                | <b>Effective Vocabulary Reading</b>                                                                                                                                                                                       | <b>9 Periods</b> |
| Vocabulary Building: Prefixes, Suffixes, Synonyms, Antonyms, One-word Substitutes-Writing Sentences and Paragraphs-Writing for Digital Platforms-Précis Writing: Rules and Examples                                                                                                                            |                                                                                                                                                                                                                           |                  |
| <b>TOTAL: 45 Periods</b>                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                           |                  |
| <b>Text Books:</b>                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>M.V. Rodrigues, "English for Effective Communication", Oxford University Press</li> <li>Simon Sweeney, "English for Business Communication", Cambridge University Press</li> </ul> |                  |

|                            |                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b>    | <ul style="list-style-type: none"> <li>• Krishna Mohan &amp; Meera Banerji, "Developing Communication Skills", Macmillan India</li> <li>• Sanjay Kumar &amp; Pushpa Lata, "Communication Skills", Oxford University Press</li> </ul> |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.coursera.org">https://www.coursera.org</a><br><a href="https://www.edx.org">https://www.edx.org</a>                                                                                                             |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                         | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Demonstrate effective listening skills in academic and general contexts.                | Apply (K3)           |
| CO2                                                       | Communicate fluently and clearly using correct pronunciation, stress, and intonation.   | Apply (K3)           |
| CO3                                                       | Participate in conversations and telephonic communications with appropriate etiquette.  | Apply (K3)           |
| CO4                                                       | Comprehend and interpret various types of texts using reading strategies.               | Analyse (K4)         |
| CO5                                                       | Produce clear, well-structured written content with appropriate vocabulary and grammar. | Create (K6)          |

## V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs<br>POs/<br>PSOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO1                    | -    | -    | -    | -    | -    | -    | -    | 2    | 3    | -     | 2     | -     | -     | -     | -     |
| CO2                    | -    | -    | -    | -    | -    | -    | -    | 2    | 3    | -     | 2     | -     | -     | -     | -     |
| CO3                    | -    | -    | -    | -    | -    | -    | -    | 2    | 3    | -     | 2     | -     | -     | -     | -     |
| CO4                    | -    | -    | -    | -    | -    | -    | -    | 2    | 3    | -     | 2     | -     | -     | -     | -     |
| CO5                    | -    | -    | -    | -    | -    | -    | -    | 2    | 3    | -     | 2     | -     | -     | -     | -     |

Mapping: 1-Low, 2-Medium, 3-High

**I - Course Name: 23MA902 - Introduction to Women and Gender Studies**

| Prerequisite | Programme Name            | Sem | Category | L | T | P | C |
|--------------|---------------------------|-----|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | -   | MC       | 3 | 0 | 0 | 0 |

**II. Course Objectives**

|    |                                                                                                        |
|----|--------------------------------------------------------------------------------------------------------|
| 1. | To familiarize students with basic gender-related concepts like sex, gender, patriarchy, and hegemony. |
| 2. | To critically examine different feminist theories and their contribution to gender discourse.          |
| 3. | To trace the historical and socio-political development of women's movements globally and in India.    |
| 4. | To analyze how language and media shape and reflect gender identities and representations.             |
| 5. | To encourage critical thinking and resistance strategies against gender discrimination.                |

**III. Course Content**

|                                                                                                                                                                                                                                                             |                                                      |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------|
| <b>Preamble</b><br>This course explores key gender concepts, feminist theories, and movements, focusing on the intersections of power, identity, and representation. It examines gender roles, media, and the impact of language in shaping societal norms. |                                                      |                  |
| <b>UNIT-I</b>                                                                                                                                                                                                                                               | <b>Concepts</b>                                      | <b>9 Periods</b> |
| Sex vs. Gender, masculinity, femineity, socialization, patriarchy, public/private, essentialism, binarism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division labor.                        |                                                      |                  |
| <b>UNIT-II</b>                                                                                                                                                                                                                                              | <b>Feminist Theory</b>                               | <b>9 Periods</b> |
| Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, Ecofeminist, Gender Identity.                                                                                                                                                          |                                                      |                  |
| <b>UNIT-III</b>                                                                                                                                                                                                                                             | <b>Women's Movements: Global, National and Local</b> | <b>9 Periods</b> |
| Rise of Feminism in Europe and America. Women's Movement in India.                                                                                                                                                                                          |                                                      |                  |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                              | <b>Gender and Language</b>                           | <b>9 Periods</b> |
| Linguistic Form and Gender, Gender and narratives                                                                                                                                                                                                           |                                                      |                  |
| <b>UNIT-V</b>                                                                                                                                                                                                                                               | <b>Gender and Representation</b>                     | <b>9 Periods</b> |
| Advertising and popular visual media. Gender and Representation in Alternative Media. Gender and social media.                                                                                                                                              |                                                      |                  |

**TOTAL: 45 Periods**

|                        |                                                                                                                                                       |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books</b>      | 1. Connell, R.W. (1995). Gender. Cambridge: Polity Press.                                                                                             |
|                        | 2. Agarwal, B. (1988). Structures of Patriarchy: State, Community and Household in Modern South Asia. New Delhi: Kali for Women.                      |
|                        | 3. Vandana Shiva (1989). Staying Alive: Women, Ecology and Development. New Delhi: Kali for Women.                                                    |
| <b>Reference Books</b> | 1. Krishnaraj, Maithreyi (Ed.). (1985). Evolving New Methodologies in Research on Women's Studies. SNDT Women's University, Bombay.                   |
|                        | 2. Harding, Sandra (1987). Feminism and Methodology. Indiana University Press.                                                                        |
|                        | 3. Rosemarie Tong (2009). Feminist Thought: A More Comprehensive Introduction. Westview Press.                                                        |
|                        | 4. Judith Butler (1990). Gender Trouble: Feminism and the Subversion of Identity. Routledge.                                                          |
|                        | 5. Radha Kumar (1993). The History of Doing: An Illustrated Account of Movements for Women's Rights and Feminism in India, 1800–1990. Kali for Women. |
| <b>Web Source</b>      | <a href="https://archive.nptel.ac.in/courses">https://archive.nptel.ac.in/courses</a>                                                                 |

**IV. Course Outcomes**

| On the completion of this course, students will be able to: |                                                                                       | Bloom's Level Mapped |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------|
| CO1                                                         | Understand foundational gender concepts and their application in real-world contexts. | Understand (K2)      |
| CO2                                                         | Apply feminist theoretical approaches to critique social norms and institutions.      | Apply (K3)           |
| CO3                                                         | Evaluate the role of social movements in shaping gender equality.                     | Evaluate (K5)        |
| CO4                                                         | Examine gendered language patterns and narrative constructions.                       | Analyze (K4)         |
| CO5                                                         | Analyze the portrayal and representation of gender in traditional and new media.      | Analyze (K4)         |

**V. Mapping Table - Mapping of COs with POs and PSOs**

| COs Vs<br>POs/<br>PSOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO1                    | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| CO2                    | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| CO3                    | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| CO4                    | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| CO5                    | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |

Mapping: 1-Low, 2-Medium, 3-High

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23MC903 - Disaster Risk Reduction and Management**

| Prerequisite | Programme Name            | Sem | Category | L | T | P | C |
|--------------|---------------------------|-----|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | -   | MC       | 3 | 0 | 0 | 0 |

**II - Course Objectives**

|    |                                                                                          |
|----|------------------------------------------------------------------------------------------|
| 1. | To understand fundamental disaster concepts and different types of disasters.            |
| 2. | To learn Disaster Risk Reduction (DRR) principles and the phases of the disaster cycle.  |
| 3. | To Grasp India's disaster management laws, policies, and institutional structures.       |
| 4. | To identify and use key tools and technologies for disaster preparedness and response.   |
| 5. | To analyze real-world disaster scenarios and develop practical response planning skills. |

**III - Course Content****Preamble:**

This course addresses the critical need to manage increasing disaster risks in our interconnected world. It focuses on reducing risks, building resilience, and fostering safety rather than just reacting to disasters.

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Hazards, Vulnerability and Disaster Risks    | 9 Periods |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------|
| Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced –Earthquake, Landslide, Flood, Drought, Fire etc – Technological disasters- Structural collapse, Industrial accidents, oil spills -Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies, - - Inter relations between Disasters and Sustainable development Goals. |                                              |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Disaster Risk Reduction (DRR)                | 9 Periods |
| Sendai Framework for Disaster Risk Reduction, Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community Based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayat Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Early Warning System – Advisories from Appropriate Agencies- Relevance of indigenous Knowledge, appropriate technology and Local resources.                                                                                                   |                                              |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Disaster Management                          | 9 Periods |
| Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction- Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Other related policies, plans, programmers and legislation - Institutional Processes and Framework at State and Central Level- (NDMA –SDMA-DDMA-NRDF- Civic Volunteers).                                                                                                                                                          |                                              |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Tools and Technology for Disaster Management | 9 Periods |
| Early warning systems -Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment. - Elements of Climate Resilient Development –Standard operation Procedure for disaster response – Financial planning for disaster Management.                                                                                         |                                              |           |

| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Disaster Management: Case Studies | 9 Periods |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------|
| Discussion on selected case studies to analyse the potential impacts and actions in the context of disasters- Landslide Hazard Zonation: Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.- Field work-Mock drill. |                                   |           |

**TOTAL: 45 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Taimpo (2016), Disaster Management and Preparedness, CRC Publications</li> <li>2. Singh R (2017), Disaster Management Guidelines for earthquakes, Landslides, Avalanches and tsunami, Horizon Press Publications</li> <li>3. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN- 13: 978-9380386423</li> <li>4. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]</li> </ol> |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005.</li> <li>2. Government of India, National Disaster Management Policy, 2009.</li> <li>3. Shaw R (2016), Community based Disaster risk reduction, Oxford University Press.</li> </ol>                                                                                                                                                                                                                                              |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.swayam2.ac.in/ini25_hs32/preview">https://onlinecourses.swayam2.ac.in/ini25_hs32/preview</a><br><a href="https://onlinecourses.swayam2.ac.in/cec25_hs135/preview">https://onlinecourses.swayam2.ac.in/cec25_hs135/preview</a><br><a href="https://onlinecourses.swayam2.ac.in/ntr25_ed61/preview">https://onlinecourses.swayam2.ac.in/ntr25_ed61/preview</a>                                                                                                                                                               |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR).                                             | Apply (K3)           |
| <b>CO2</b>                                                | To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction.                                | Apply (K3)           |
| <b>CO3</b>                                                | To develop disaster response skills by adopting relevant tools and technology.                                                                | Apply (K3)           |
| <b>CO4</b>                                                | Enhance awareness of institutional processes for Disaster response in the country.                                                            | Understand (K2)      |
| <b>CO5</b>                                                | Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity. | Apply (K3)           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs<br>POs/<br>PSOs | PO<br>1 | PO<br>2 | PO<br>3 | PO<br>4 | PO<br>5 | PO<br>6 | PO<br>7 | PO<br>8 | PO<br>9 | PO<br>10 | PO<br>11 | PO1<br>2 | PSO<br>1 | PSO<br>2 | PSO<br>3 |
|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|----------|
| CO1                    | 3       | 3       | 3       | 3       | -       | -       | 2       | 2       | -       | -        | 2        | -        | -        | -        | -        |
| CO2                    | 3       | 3       | 3       | 3       | -       | -       | 2       | 1       | -       | -        | 2        | -        | -        | -        | -        |
| CO3                    | 3       | 3       | 3       | 3       | -       | -       | 2       | 2       | -       | -        | -        | -        | -        | -        | -        |
| CO4                    | 3       | 3       | 3       | 3       | -       | -       | 2       | 1       | -       | -        | 2        | -        | -        | -        | -        |
| CO5                    | 3       | 3       | 3       | 3       | -       | -       | 2       | 2       | -       | -        | 2        | -        | -        | -        | -        |

Mapping: 1-Low, 2-Medium, 3-High

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23MC904 - History of Science and Technology in India**

| Prerequisite | Programme Name            | Sem | Category | L | T | P | C |
|--------------|---------------------------|-----|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | -   | MC       | 3 | 0 | 0 | 0 |

**II - Course Objectives**

|    |                                                                                            |
|----|--------------------------------------------------------------------------------------------|
| 1. | To learn sources of history of Science, Technology and Medicine in Early India             |
| 2. | To understand the development of Science and Technology in Medieval India.                 |
| 3. | To study the different scientific surveys and debates in British India.                    |
| 4. | To analyse the developments of Science, Technology and Medicine in Independent India.      |
| 5. | To analyse the developments of Agriculture Technology and Harvesting in Independent India. |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                          |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------|
| <b>Preamble:</b> Students will be able to: Understand the premises informing the twin themes of science and Technology, development of science, and origin of Agriculture in perspective.                                                                                                                                                                                                                                                                           |                                                          |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Concepts and Perspectives</b>                         | <b>9 Periods</b> |
| Meaning of History Objectivity, Determinism, Relativism, Causation, Generalization in History; Moral judgment in history Extent of subjectivity, contrast with physical sciences, interpretation and speculation, causation verses evidence, concept of historical inevitability, Historical Positivism. Science and Technology-Meaning, Scope and Importance, Interaction of science, technology & society, Sources of history on science and technology in India. |                                                          |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Historiography of Science and Technology in India</b> | <b>9 Periods</b> |
| Introduction to the works of D.D. Kosambi, Dharmapal, Debiprasad Chattopadhyay, Rehman, S. Irfan Habib, Deepak Kumar, Dhruv Raina, and others.                                                                                                                                                                                                                                                                                                                      |                                                          |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Science and Technology in Ancient India</b>           | <b>9 Periods</b> |
| Technology in pre-historic period Beginning of agriculture and its impact on technology Science and Technology during Vedic and Later Vedic times Science and technology from 1st century AD to C-1200.                                                                                                                                                                                                                                                             |                                                          |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Science and Technology in Medieval India</b>          | <b>9 Periods</b> |
| Legacy of Technology in Medieval India, Interactions with Arabs Development in medical knowledge, interaction between Unani and Ayurveda and alchemy Astronomy and Mathematics: interaction with Arabic Sciences Science and Technology on the eve of British conquest                                                                                                                                                                                              |                                                          |                  |



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401



|                                                                                                                                                                                                |                                                                  |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------|
| <b>Unit – V</b>                                                                                                                                                                                | <b>Agrarian Technology: History of Agriculture and Hydrology</b> | <b>9 Periods</b> |
| Plant science in ancient India – Knowledge of plants and agricultural practices - Agricultural tools and technology Water harvesting technology – Harappan, Mauryan, Gupta and Post Gupta eras |                                                                  |                  |

**TOTAL: 45 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <p>1. Arnold, David, 1999. Science, Technology and Medicine in Colonial India, The New Cambridge History of India Series, Cambridge, Oxford University Press.</p> <p>2. Bose, D. N., 1989. A Concise History of Science in India, New Delhi, Indian National Science Academy.</p> <p>3. Dharmapal, 1971. Indian Science and Technology in the Eighteenth Century, Delhi. Gopal, S. and Kumar Ravindra, Colonial Development, Education and Social Awareness up to 2000, PHISPC, Delhi, Oxford University Press.</p> |
| <b>Reference Books:</b>    | <p>1. Jaggi, O. P., 1977. Medicines in Medieval India, Delhi, Atma Ram &amp; Sons, Delhi.</p> <p>2. Jaggi, O. P., Dawn of Indian Technology (Pre &amp; Proto Historic Period – Vol. I) (Vedic &amp; Upnishadic Period – Vol. II) Indian System of Medicine Vol. IV, Indian Astronomy &amp; Mathematics Vol. VI, Science &amp; technology in Medieval – India Vol. VII, S. Delhi, Atma Ram &amp; Sons.</p>                                                                                                           |
| <b>MOOC/Web Platforms:</b> | <p>Web source</p> <p>1. <a href="https://dst.gov.in/">https://dst.gov.in/</a></p> <p>2. <a href="https://www.india.gov.in/topics/science-technology">https://www.india.gov.in/topics/science-technology</a></p>                                                                                                                                                                                                                                                                                                     |

**IV - Course Outcomes**

| <b>On completion of the course, the students will be able to</b> |                                                                                                                                                             | <b>Bloom's Level Mapped</b> |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>CO1</b>                                                       | Explain the meaning, scope, and importance of science and technology and their interaction with society through historical perspectives.                    | Apply (K3)                  |
| <b>CO2</b>                                                       | Evaluate the impact of these historiographical works on the understanding of indigenous knowledge systems and colonial influence on science and technology. | Apply (K3)                  |
| <b>CO3</b>                                                       | Trace the evolution of science and technology in India from the 1st century AD to around 1200 AD.                                                           | Apply (K3)                  |
| <b>CO4</b>                                                       | Examine developments in medical knowledge, particularly the interplay between Unani, Ayurveda, and alchemy.                                                 | Analyze (K4)                |
| <b>CO5</b>                                                       | Analyze the evolution of water harvesting and irrigation technologies during the Harappan, Mauryan, Gupta, and Post-Gupta periods                           | Analyze (K4)                |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs<br>POs/<br>PSOs | PO<br>1 | PO<br>2 | PO<br>3 | PO<br>4 | PO<br>5 | PO<br>6 | PO<br>7 | PO<br>8 | PO<br>9 | PO<br>10 | PO<br>11 | PO1<br>2 | PSO<br>1 | PSO<br>2 | PSO<br>3 |
|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|----------|
| CO1                    | 2       | 1       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        | -        | -        | -        |
| CO2                    | 2       | 1       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        | -        | -        | -        |
| CO3                    | 2       | 1       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        | -        | -        | -        |
| CO4                    | 2       | 1       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        | -        | -        | -        |
| CO5                    | 2       | 1       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        | -        | -        | -        |

Mapping: 1-Low, 2-Medium, 3-High

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23MC905 - Political and Economic Thought for a Human Society

| Prerequisite | Programme Name            | Sem | Category | L | T | P | C |
|--------------|---------------------------|-----|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | -   | MC       | 3 | 0 | 0 | 0 |

## II - Course Objectives

|    |                                                                                                                                             |
|----|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | The course will start by exploring human needs and desires, and how various political and economic systems attempt to address them          |
| 2. | The course will culminate in a critical assessment of the systems discussed, examining their past execution and exploring future prospects. |

## III - Course Content

|                                                                                                                                                                                    |                                                              |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------|
| <b>Preamble:</b><br>This course explores political and economic ideas that shape just and equitable societies, emphasizing human dignity, inclusivity, and ethical responsibility. |                                                              |                  |
| <b>Unit – I</b>                                                                                                                                                                    | <b>Foundations of a Human Society</b>                        | <b>9 Periods</b> |
| Considerations for human society, holistic thought, human being's desires, harmony in self, harmony in relationships, society, and nature, societal systems.                       |                                                              |                  |
| <b>Unit – II</b>                                                                                                                                                                   | <b>Political and Economic Systems in the Modern World</b>    | <b>9 Periods</b> |
| Capitalism – Free markets, demand-supply, perfect competition, laissez-faire, monopolies, imperialism. Liberal democracy, Fascism and totalitarianism. World War I and II.         |                                                              |                  |
| <b>Unit – III</b>                                                                                                                                                                  | <b>Foundations and Models of Communism</b>                   | <b>9 Periods</b> |
| Communism – Mode of production, theory of labour, surplus value, class struggle, dialectical materialism, historical materialism, Russian and Chinese models.                      |                                                              |                  |
| <b>Unit – IV</b>                                                                                                                                                                   | <b>The Welfare State and Human-Centered Development</b>      | <b>9 Periods</b> |
| Welfare state. Relation with human desires. Empowered human beings, satisfaction, Gandhian thought. Swaraj, Decentralized economy & polity, Community. Control over one's lives.   |                                                              |                  |
| <b>Unit – V</b>                                                                                                                                                                    | <b>Indian Civilization and the Shaping Forces of Society</b> | <b>9 Periods</b> |
| Relationship with nature, Essential elements of Indian civilization, Technology as driver of society, Role of education in shaping of society. Future directions                   |                                                              |                  |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | <ol style="list-style-type: none"> <li>1. R. Nagaraj, "The Flaming Feet and other Essays: The Dalit Movement in India," Seagull Books London Ltd.</li> <li>2. J. C. Kumarappa and Gandhi's Struggle for Economic Justice", Venu Madhav Govindu and Deepak Malghan, Oxford University Press; Illustrated edition (August 2016).</li> <li>3. "The Theory of Moral Sentiments", Adam Smith, Penguin Classics; Anniversary edition (May 2010).</li> <li>4. "The Principles of Political Economy", John Stuart Mill, Create Space Independent Pub (September 2016).</li> </ol> |
| <b>Reference Books:</b> | <ol style="list-style-type: none"> <li>1. Challengers to capitalism: Marx, Lenin, and Mao", John G. Gurley, San Francisco Book Co (January 1976)</li> <li>2. "Small is Beautiful: Economics as if People Mattered", E. F. Schumacher, Harper Perennial; Reprint edition (October 2010)</li> <li>3. "The History and Culture of the Indian People: Volume 9: British Paramountcy and Indian</li> </ol>                                                                                                                                                                     |

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            | Renaissance Part I", R.C. Majumdar, Bhartiya Vidya Bhavan ( January 2002)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| MOOC/<br>Web<br>Platforms: | <a href="https://www.sistk.org/downloads/MATERIALS/23HS0814-UHV.pdf?utm_source=chatgpt.com">https://www.sistk.org/downloads/MATERIALS/23HS0814-UHV.pdf?utm_source=chatgpt.com</a><br><a href="https://www.investopedia.com/articles/investing/102914/main-characteristics-capitalist-economies.asp">https://www.investopedia.com/articles/investing/102914/main-characteristics-capitalist-economies.asp</a><br><a href="https://uhv.org.in/UHV-II%20Course%20Material%202024/L%2022%20Sum%20Up%20and%20Program%20v5.pdf?utm_source=chatgpt.com">https://uhv.org.in/UHV-II%20Course%20Material%202024/L%2022%20Sum%20Up%20and%20Program%20v5.pdf?utm_source=chatgpt.com</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                                       | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Relationship with nature, Essential elements of Indian civilization, Technology as driver of society, Role of education in shaping of society. Future directions      | Understand (K2)      |
| CO2                                                       | Demonstrate the ability to analyze and resolve ethical dilemmas using principles of universal human values and ethical reasoning.                                     | Understand (K2)      |
| CO3                                                       | Develop an appreciation for cultural diversity and demonstrate behaviours that reflect sensitivity and respect for different cultural perspectives and practices.     | Apply (K3)           |
| CO4                                                       | Identify and engage in actions that reflect human values, contributing positively to their communities and promoting social harmony                                   | Apply (K3)           |
| CO5                                                       | Regularly reflect on their personal development in terms of values and ethics, and articulate ways in which they can continue to grow and apply these in their lives. | Apply (K3)           |

## V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs<br>POs/<br>PSOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO1                    | 1    | 3    | -    | 3    | 3    | -    | 3    | -    | 3    | 3     | 3     | -     | -     | -     | -     |
| CO2                    | 1    | 3    | -    | 2    | 3    | -    | 3    | 2    | 2    | 3     | 3     | 1     | -     | -     | -     |
| CO3                    | 1    | 3    | -    | 3    | 3    | -    | 2    | 2    | 2    | 2     | 3     | -     | -     | -     | -     |
| CO4                    | 1    | 3    | -    | 2    | 2    | -    | 2    | 3    | 2    | 3     | 1     | -     | -     | -     | -     |
| CO5                    | 1    | 3    | -    | 2    | 3    | -    | 3    | 3    | 3    | 3     | 2     | 1     | -     | -     | -     |

Mapping: 1-Low, 2-Medium, 3-High

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23MC906 - Well-Being with Traditional Practices-Yoga, Ayurveda, and Siddha**

| Prerequisite | Programme Name            | Sem | Category | L | T | P | C |
|--------------|---------------------------|-----|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | -   | MC       | 3 | 0 | 0 | 0 |

**II - Course Objectives**

|    |                                                                                                         |
|----|---------------------------------------------------------------------------------------------------------|
| 1. | To Understand the essential components of health and their importance.                                  |
| 2. | To Develop confidence to maintain a healthy lifestyle.                                                  |
| 3. | To Learn effective techniques to prevent lifestyle-related disorders.                                   |
| 4. | To Recognize the role of balanced diet and physical activity in health maintenance.                     |
| 5. | To Explore traditional systems like Ayurveda and Siddha for holistic well-being and disease prevention. |

**III - Course Content****Preamble:**

This course explores holistic health and wellness, emphasizing the importance of prevention over treatment. It delves into various dimensions of health—physical, mental, emotional, social, spiritual, and environmental—while highlighting the role of diet, traditional medicine, and lifestyle in disease prevention. With insights from modern science and ancient Indian systems like Ayurveda and Siddha, learners gain practical tools for maintaining well-being. The course also reflects on the relationship between civilization, nature, and technology in shaping future health and societal outcomes.

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Health and its Importance | 9 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------|
| <p><b>Present health status</b> -Definition -Importance of maintaining health – More importance on prevention than treatment. Ten types of health one has to maintain – Physical health – Mental health – Social health – Financial health – Emotional health – Spiritual health – Intellectual health – Relationship health – Environmental health – Occupational/Professional health</p> <p><b>Types of diseases and disorders</b>-The life expectancy-present status – mortality rate – dreadful diseases non-communicable diseases (NCDs) the leading cause of death – 60% – heart disease – cancer – diabetes – chronic pulmonary diseases – risk factors – tobacco – alcohol – unhealthy diet – lack of physical activities.</p> <p><b>Types of diseases and disorders</b> – Lifestyle disorders – Obesity – Diabetes – cardiovascular diseases - Cancer – Strokes – COPD – Arthritis – Mental health issues</p> <p><b>Causes of the above diseases/disorders</b> – <b>Importance of prevention of illness</b> – Takes care of health – Improves quality of life – Reduces absenteeism – Increase satisfaction – Saves time</p> <p><b>Simple lifestyle modifications to maintain health</b> – Healthy Eating habits (Balanced diet according to age) Physical Activities (Stretching exercise, aerobics, resisting exercise) – Maintaining BMI Importance and</p> |                           |           |

Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Diet                                                    | 9 Periods |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-----------|
| <p><b>Role of diet in maintaining health</b> – energy one needs to keep active throughout the day – nutrients one needs for growth and repair – helps one to stay strong and healthy – helps to prevent diet-related illness, such as some cancers – keeps active and – helps one to maintain a healthy weight – helps to reduce risk of developing lifestyle disorders like diabetes – arthritis – hypertension – PCOD – infertility – ADHD – sleeplessness -helps to reduce the risk of heart diseases – keeps the teeth and bones strong.</p> <p><b>Balanced Diet and its 7 Components</b> – Carbohydrates – Proteins – Fats – Vitamins – Minerals Fibre and Water.</p> <p><b>Food additives and their merits &amp; demerits</b> – Effects of food additives – Types of food additives Food additives and processed foods – Food additives and their reactions</p> <p><b>Definition of BMI and maintaining it with diet</b><br/>Importance – Consequences of not maintaining BMI – different steps to maintain optimal BMI Nutrigenomics: How Food Influences Gene Expression. Anti-inflammatory and Immunomodulatory Diets in Traditional Medicine</p> <p><b>Common cooking mistakes</b> - Different cooking methods, merits and demerits of each method</p> |                                                         |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Role of Ayurveda & Siddha Systems in Maintaining Health | 9 Periods |
| <p><b>AYUSH systems and their role in maintaining health</b> – preventive aspect of AYUSH – AYUSH as a soft therapy.</p> <p><b>Secrets of traditional healthy living</b> – Traditional Diet and Nutrition – Regimen of Personal and Social Hygiene – Daily routine (Dinacharya) – Seasonal regimens (Ritucharya) – basic sanitation and healthy living environment – Sadvritta (good conduct) – for conducive social life.</p> <p><b>Principles of Siddha &amp; Ayurveda systems</b> – Macrocosm and Microcosm theory – Panchcheekarana Theory / (Five Element Theory) 96 fundamental Principles – Uyir Thathukkal (Tri-Dosha Theory) – Udal Thathukkal Tridosha Theory and Its Modern Biomedical Correlates. Rasayana and Kayakalpa: Traditional Rejuvenation Therapies. Role of Siddha Varma and Marma Therapies in Neurological and Musculoskeletal Health</p>                                                                                                                                                                                                                                                                                                                                                                                                |                                                         |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Mental Wellness                                         | 9 Periods |
| <p><b>Emotional health</b> – Definition and types – Three key elements: the subjective experience – the physiological response – the behavioral response – Importance of maintaining emotional health Role of emotions in daily life -Short term and long-term effects of emotional disturbances – Leading a healthy life with emotions – Practices for emotional health – Recognize how thoughts influence emotions – Cultivate positive thoughts – Practice self-compassion – Expressing a full range of emotions.</p> <p><b>Stress management</b> – Stress definition – Stress in daily life – How stress affects one's life – Identifying the cause of stress – Symptoms of stress – Managing stress (habits, tools, training, professional help) – Complications of stress mismanagement.</p> <p><b>Sleep</b> – Sleep and its importance for mental wellness – Sleep and digestion.</p> <p><b>Immunity</b> – Types and importance – Ways to develop immunity</p>                                                                                                                                                                                                                                                                                            |                                                         |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Civilization, Nature, and the Role of Technology        | 9 Periods |
| Relationship with nature, Essential elements of Indian civilization, Technology as driver of society, Role of education in shaping of society. Future directions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                         |           |

TOTAL: 45 Periods

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books</b>                   | <ol style="list-style-type: none"> <li>1. WHAT WE KNOW ABOUT EMOTIONAL INTELLIGENCE How It Affects Learning, Work, Relationships, and Our Mental Health, by Moshe Zeidner, Gerald Matthews, and Richard D. Roberts</li> <li>2. A Bradford Book, The MIT Press, Cambridge, Massachusetts, London, England</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Reference Books:</b>             | <ol style="list-style-type: none"> <li>1. The Mindful Self-Compassion Workbook, Kristin Neff, Ph.D Christopher Germer, Ph.D, Published by The Guilford Press A Division of Guilford Publications, Inc.370 Seventh Avenue, Suite 1200, New York, NY 10001</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>MOOC/<br/>Web<br/>Platforms:</b> | <ul style="list-style-type: none"> <li>• <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4799645/Simple%20lifestyle%20modifications%20to%20maintain%20health">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4799645/Simple lifestyle modifications to maintain health</a></li> <li>• <a href="https://www.niddk.nih.gov/health-information/diet-nutrition/changing-habits-betterhealth#:~:text=Make%20your%20new%20healthy%20habit,t%20have%20time%20to%20cook.">https://www.niddk.nih.gov/health-information/diet-nutrition/changing-habits-betterhealth#:~:text=Make%20your%20new%20healthy%20habit,t%20have%20time%20to%20cook.</a></li> <li>• Benefits of healthy eating <a href="https://www.cdc.gov/nutrition/resources-">https://www.cdc.gov/nutrition/resources-</a></li> </ul> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Learn the importance of different components of health                             | Understand (K2)      |
| CO2                                                       | Gain confidence to lead healthy life.                                              | Apply (K3)           |
| CO3                                                       | Learn new techniques to prevent lifestyle health disorders                         | Apply (K3)           |
| CO4                                                       | Understand the importance of diet and workouts in maintaining health               | Understand (K2)      |
| CO5                                                       | Explore traditional health systems for holistic well-being and disease prevention. | Apply (K3)           |

## V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs<br>POs/<br>PSOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO1                    | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| CO2                    | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| CO3                    | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| CO4                    | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| CO5                    | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |

Mapping: 1-Low, 2-Medium, 3-High

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23MC907 - State, Nation Building and Politics in India**

| Prerequisite | Programme Name            | Sem | Category | L | T | P | C |
|--------------|---------------------------|-----|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | -   | MC       | 3 | 0 | 0 | 0 |

**II - Course Objectives**

|    |                                                                                                                                                           |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To understand how the state operates through its main branches: the executive, legislature, and judiciary.                                                |
| 2. | To familiarize the student with the foundational ideas of politics and sovereignty, and how they're changing in our interconnected world.                 |
| 3. | To familiarize the students with the historical journey of India's national movement and the evolution of its Constitution.                               |
| 4. | To make the students understand why India adopted a parliamentary-federal system and the core principles behind its Constitution.                         |
| 5. | To acquaint the student with the dynamic nature of India's political landscape, including current challenges in national integration and nation-building. |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                             |                                                              |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------|
| <b>Preamble:</b><br>From this course, understanding the political landscape, the functioning of the state, and the ongoing process of nation-building is crucial for truly impactful contributions. This course will equip the students with a nuanced perspective on how India, a vibrant and complex democracy, operates. |                                                              |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                             | <b>State, Sovereignty, and Political Dynamics</b>            | <b>8 Periods</b> |
| Understanding the need and role of State and politics.<br>Development of Nation-State, sovereignty, sovereignty in a globalized world.                                                                                                                                                                                      |                                                              |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                            | <b>Structure and Functioning of the State</b>                | <b>8 Periods</b> |
| Organs of State – Executive, Legislature, Judiciary. Separation of powers, forms of government- unitary-federal, Presidential-Parliamentary, The idea of India.                                                                                                                                                             |                                                              |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                           | <b>The Revolt of 1857 and the National Awakening</b>         | <b>7 Periods</b> |
| 1857 and the national awakening.                                                                                                                                                                                                                                                                                            |                                                              |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                            | <b>Indian National Movement and Constitution Making</b>      | <b>7 Periods</b> |
| 1885 Indian National Congress and development of national movement – its legacies. Constitution making and the Constitution of India.                                                                                                                                                                                       |                                                              |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                             | <b>Foundations of Federalism and Nation-Building</b>         | <b>7 Periods</b> |
| Goals, objective and philosophy. Why a federal system? National integration and nation-building.                                                                                                                                                                                                                            |                                                              |                  |
| <b>Unit – VI</b>                                                                                                                                                                                                                                                                                                            | <b>Contemporary Challenges and Future of Indian Politics</b> | <b>8 Periods</b> |
| Challenges of nation-building – State against democracy (Kothari) New social movements.<br>The changing nature of Indian Political System, the future scenario. What can we do?                                                                                                                                             |                                                              |                  |

**TOTAL: 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Sunil Khilnani, The Idea of India. Penguin India Ltd., New Delhi.<br>2. Madhav Khosla, The Indian Constitution, Oxford University Press. New Delhi, 2012.<br>3. Brij Kishore Sharma, Introduction to the Indian Constitution, PHI, New Delhi, latest edition.<br>4. Sumantra Bose, Transforming India: Challenges to the World's Largest Democracy, Picador India, 2013.<br>5. Atul Kohli, Democracy and Discontent: India's Growing Crisis of Governability, Cambridge University Press, Cambridge, U. K., 1991.<br>6. M. P. Singh and Rekha Saxena, Indian Politics: Contemporary Issues and Concerns, PHI, New Delhi, 2008, latest edition.<br>7. Rajni Kothari, Rethinking Democracy, Orient Longman, New Delhi, 2005. |
| <b>Reference Books:</b>    | 1. D. D. Basu, Introduction to the Constitution of India. LexisNexis/PHI Learning.<br>2. Granville Austin, The Indian Constitution: Cornerstone of a Nation. Oxford University Press.<br>3. Ramachandra Guha, India After Gandhi: The History of the World's Largest Democracy. Picador India.<br>4. Christophe Jaffrelot, The Hindu Nationalist Movement and Indian Politics. Penguin India.                                                                                                                                                                                                                                                                                                                                 |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc25_lw05/preview">https://onlinecourses.nptel.ac.in/noc25_lw05/preview</a><br><a href="https://onlinecourses.nptel.ac.in/noc25_lw19/preview">https://onlinecourses.nptel.ac.in/noc25_lw19/preview</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Grasp the theoretical aspect of the state, its various organs, and how they function.                              | Apply (K3)           |
| <b>CO2</b>                                                | Understand the historical context and philosophical basis of India's current political system.                     | Apply (K3)           |
| <b>CO3</b>                                                | Identify the major challenges and ongoing efforts related to national integration and nation-building in India.    | Apply (K3)           |
| <b>CO4</b>                                                | Develop a clear and accurate understanding of India's political system and processes.                              | Understand (K2)      |
| <b>CO5</b>                                                | Critically analyze to improve civic participation and contribute to better governance and public service delivery. | Apply (K3)           |

**V - Mapping Table - Mapping of COs with POs and PSOs**

| COs Vs POs/ PSOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO1</b>       | 3    | 3    | 1    | 1    | -    | 3    | -    | 2    | 2    | -     | 1     | 3     | -     | -     | -     |
| <b>CO2</b>       | 3    | 3    | 1    | 1    | -    | 3    | -    | 2    | 2    | -     | 1     | 3     | -     | -     | -     |
| <b>CO3</b>       | 3    | 3    | 1    | 1    | -    | 3    | -    | 2    | 2    | -     | 1     | 3     | -     | -     | -     |
| <b>CO4</b>       | 3    | 3    | 1    | 1    | -    | 3    | -    | 2    | 2    | -     | 1     | 3     | -     | -     | -     |
| <b>CO5</b>       | 3    | 3    | -    | -    | -    | 3    | -    | 2    | 2    | -     | -     | 2     | -     | -     | -     |

Mapping: 1-Low, 2-Medium, 3-High

## I - Course Name: 23MC908 - Industrial Safety

| Prerequisite | Programme Name            | Sem | Category | L | T | P | C |
|--------------|---------------------------|-----|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | -   | MC       | 3 | 0 | 0 | 0 |

## II - Course Objectives

|    |                                                                            |
|----|----------------------------------------------------------------------------|
| 1. | To impart knowledge on different facets and aspects of engineering systems |
| 2. | To understand the Focusing on Tools, and the techniques.                   |
| 3. | To study the Methodologies needed for prevention of Occurrence.            |
| 4. | To analyze the accidents under different industrial settings.              |
| 5. | To analyze the Environmental condition to avoid noise pollution.           |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                                       |                                    |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------|
| <b>Preamble:</b> Students will be able to: Understand the premises informing the twin themes of Industrial Safety techniques to avoid the accidents.                                                                                                                                                                                                                                                                  |                                    |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Safety Terminologies</b>        | <b>9 Periods</b> |
| Hazard-Types of Hazard- Risk-Hierarchy of Hazards Control Measures-Lead indicators- lag Indicators- Flammability- Toxicity Time-weighted Average (TWA) – Threshold Limit Value (TLV) – Short Term Exposure Limit (STEL)- Immediately dangerous to life or health (IDLH)- acute and chronic effects- Routes of Chemical Entry-Personnel Protective Equipment- Health and Safety Policy-Material Safety Data Sheet MSDS |                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Standards and Regulations</b>   | <b>9 Periods</b> |
| Indian Factories Act-1948- Health- Safety- Hazardous materials and Welfare- ISO 45001:2018 occupational health and safety (OH&S) – Occupational Safety and Health Audit IS14489:1998- Hazard Identification and Risk Analysis- code of practice IS 15656:2006                                                                                                                                                         |                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Safety Activities</b>           | <b>9 Periods</b> |
| Toolbox Talk- Role of safety Committee- Responsibilities of Safety Officers and Safety Representatives- Safety Training and Safety Incentives- Mock Drills- On-site Emergency Action Plan- Off-site Emergency Action Plan- Safety poster and Display- Human Error Assessment                                                                                                                                          |                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Workplace Health and Safety</b> | <b>9 Periods</b> |
| Noise hazard- Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA- Unsafe act & Unsafe Condition- Electrical Hazards- Crane Safety- Toxic gas Release                                                                                                                                                                                                             |                                    |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Environmental Control</b>       | <b>9 Periods</b> |
| Industrial Health Hazards – Environmental Control – Industrial Noise – Noise measuring instruments, Control of Noise, Vibration – Personal Protection.                                                                                                                                                                                                                                                                |                                    |                  |

TOTAL: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. R.K. Jain and Prof. Sunil S. Rao Industrial Safety, Health and Environment Management Systems, Khanna Publisher.<br>2. L. M. Deshmukh Industrial Safety Management: Hazard Identification and Risk Control McGraw-Hill Education<br>3. Frank Lees (2012) 'Lees' Loss Prevention in Process Industries. Butterworth-Heinemann publications, UK, 4 <sup>th</sup> Edition.     |
| <b>Reference Books:</b>    | 1. John Ridley & John Channing (2008) Safety at Work: Routledge, 7 <sup>th</sup> Edition.<br>2. Dan Petersen (2003) Techniques of Safety Management: A System Approach.<br>3. Alan Waring.(1996).Safety management system: Chapman & Hall, England Society of Safety Engineers, USA                                                                                            |
| <b>MOOC/Web Platforms:</b> | 1. <a href="https://archive.nptel.ac.in/courses/110/105/110105094/">https://archive.nptel.ac.in/courses/110/105/110105094/</a><br>2. <a href="https://www.shiksha.com/online-courses/industrial-safety-courses-certification-training-by-nptel-st575-tg1307">https://www.shiksha.com/online-courses/industrial-safety-courses-certification-training-by-nptel-st575-tg1307</a> |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                                                      | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the concepts of flammability, toxicity, and various exposure limits.                                                                      | Apply (K3)           |
| <b>CO2</b>                                                | Explain the key provisions of the Indian Factories Act and apply the principles of ISO 45001:2018                                                    | Apply (K3)           |
| <b>CO3</b>                                                | Identify the responsibilities and duties of Safety Officers and Safety Representatives in ensuring compliance with safety protocols and regulations. | Apply (K3)           |
| <b>CO4</b>                                                | Identify and assess common workplace hazards such as noise, particulate matter, and toxic gas release, and evaluate their impact on worker health.   | Analyze (K4)         |
| <b>CO5</b>                                                | Describe the sources and effects of industrial noise and use noise measuring instruments to assess workplace noise levels.                           | Analyze (K4)         |

**V - Mapping Table - Mapping of COs with POs and PSOs**

| COs Vs POs/ PSOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO1</b>       | 2    | 1    | -    | -    | -    | -    | -    | -    | -    | -     | -     | -     | -     | -     | -     |
| <b>CO2</b>       | 2    | 1    | -    | -    | -    | -    | -    | -    | -    | -     | -     | -     | -     | -     | -     |
| <b>CO3</b>       | 2    | 1    | -    | -    | -    | -    | -    | -    | -    | -     | -     | -     | -     | -     | -     |
| <b>CO4</b>       | 2    | 1    | -    | -    | -    | -    | -    | -    | -    | -     | -     | -     | -     | -     | -     |
| <b>CO5</b>       | 2    | 1    | -    | -    | -    | -    | -    | -    | -    | -     | -     | -     | -     | -     | -     |

Mapping: 1-Low, 2-Medium, 3-High

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23MC909 - Indian Constitution

| Prerequisite | Programme Name            | Sem | Category | L | T | P | C |
|--------------|---------------------------|-----|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | -   | MC       | 3 | 0 | 0 | 0 |

## II - Course Objectives

|    |                                                                                                  |
|----|--------------------------------------------------------------------------------------------------|
| 1. | Understand the basics of Constitution of India – meaning, nature, fundamental right and duties.  |
| 2. | Explain the parliamentary system of the government and the relationship between the governments. |
| 3. | Detail the powers and functions of Central government.                                           |
| 4. | Detail the powers and functions of State government.                                             |

## III - Course Content

**Preamble:**

Students will be able to: Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional

- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

|                                                                                                                                                                                                                                                                          |                                                     |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                          | <b>History of Making of The Indian Constitution</b> | <b>9 Periods</b> |
| History, Drafting Committee, (Composition & Working)                                                                                                                                                                                                                     |                                                     |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                         | <b>Philosophy of The Indian Constitution</b>        | <b>9 Periods</b> |
| Preamble, Salient Features                                                                                                                                                                                                                                               |                                                     |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                        | <b>Contours of Constitutional Rights and Duties</b> | <b>9 Periods</b> |
| Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.                          |                                                     |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                         | <b>Organs of Governance</b>                         | <b>9 Periods</b> |
| Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.                                          |                                                     |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                          | <b>Indian Society</b>                               | <b>9 Periods</b> |
| Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections. |                                                     |                  |

**TOTAL:45 Periods**



|                            |                                                                                                                                                        |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1.The Constitution of India,1950(Bare Act),Government Publication<br>2.Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015. |
| <b>Reference Books:</b>    | 1.M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.<br>2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015        |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc20_lw02/preview">https://onlinecourses.nptel.ac.in/noc20_lw02/preview</a>                                |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                          | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Describe the historical background and events that led to the framing of the Indian Constitution.                                                        | Apply (K3)           |
| CO2                                                       | Identify and analyze the salient features of the Indian Constitution, including federalism, parliamentary democracy, secularism, and the rule of law.    | Apply (K3)           |
| CO3                                                       | Explain the significance and scope of Fundamental Rights enshrined in the Indian Constitution and their role in ensuring individual liberty and equality | Apply (K3)           |
| CO4                                                       | Describe the qualifications and disqualifications of Members of Parliament and assess their significance in maintaining democratic integrity             | Analyze (K4)         |
| CO5                                                       | Analyze the structure of Indian society, including the role and interrelationship of caste, religion, and language.                                      | Analyze (K4)         |

## V - Mapping Table - Mapping of COs with POs and PSOs

| COs Vs POs/ PSOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO1              | 2    | 1    | -    | -    | -    | -    | -    | -    | -    | -     | -     | -     | -     | -     | -     |
| CO2              | 2    | 1    | -    | -    | -    | -    | -    | -    | -    | -     | -     | -     | -     | -     | -     |
| CO3              | 2    | 1    | -    | -    | -    | -    | -    | -    | -    | -     | -     | -     | -     | -     | -     |
| CO4              | 2    | 1    | -    | -    | -    | -    | -    | -    | -    | -     | -     | -     | -     | -     | -     |
| CO5              | 2    | 1    | -    | -    | -    | -    | -    | -    | -    | -     | -     | -     | -     | -     | -     |

Mapping: 1-Low, 2-Medium, 3-High

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23MC910 - Elements of Literature

| Prerequisite | Programme Name            | Sem | Category | L | T | P | C |
|--------------|---------------------------|-----|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | -   | MC       | 3 | 0 | 0 | 0 |

## II - Course Objectives

|    |                                                                                                                                           |
|----|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To identify and define the fundamental elements of literature, including plot, character, setting, theme, point of view, tone, and style. |
| 2. | To analyze literary works across various genres such as fiction, poetry, and drama using appropriate literary terminology.                |
| 3. | To interpret how literary devices and techniques contribute to the meaning and impact of a text.                                          |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                     |                                   |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------|
| <b>Preamble:</b>                                                                                                                                                                                                                                                                                                                    |                                   |                  |
| The course Elements of Literature is designed to introduce students to the foundational components of literary works and to cultivate an appreciation for the art of storytelling. Through the study of various genres, styles, and cultural contexts, students will develop critical reading, analytical, and interpretive skills. |                                   |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                     | <b>Introduction to Literature</b> | <b>9 Periods</b> |
| Nature, purpose, and scope of literature - Functions of literature: Emotional, social, moral, aesthetic - Literature as a reflection of life and a tool for transformation – Enhancing reading, writing, critical thinking, and discussion through literature - Understanding catharsis and human empathy through texts.            |                                   |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                    | <b>Elements of Fiction</b>        | <b>9 Periods</b> |
| Fiction, fact, and literary truth-Narrative techniques and perspectives - Plot structure: exposition, conflict, climax, resolution - Characterization: dynamic vs static, round vs flat - Setting, theme, tone, and atmosphere                                                                                                      |                                   |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                   | <b>Elements of Poetry</b>         | <b>9 Periods</b> |
| Emotions, imagination, and subjective experience – Figurative language: simile, metaphor, conceit, symbol, pun, irony - Devices of sound: alliteration, assonance, rhyme, rhythm - Poetic forms: sonnet, ballad, haiku, free verse - Personification, animation, rhetorical trends.                                                 |                                   |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                    | <b>Elements of Drama</b>          | <b>9 Periods</b> |
| Drama as a performative and representational art - Dramatic modes and structural components: act, scene, dialogue - Theatrical performance and stage directions - Drama as narration, mediation, and persuasion - Features of tragedy, comedy, satire.                                                                              |                                   |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                                                                                                                                                                                                                                                                                                                   |                                           |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------|
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                   | <b>Introduction to Literary Criticism</b> | <b>9 Periods</b> |
| What is literary theory? - Brief overview of major schools: Formalism, Marxism, Psychoanalysis, Feminism - Applying critical perspectives to text interpretation - Writing literary analysis: structure, thesis, evidence, citation - Interdisciplinary connections: literature and society, history, psychology. |                                           |                  |

**TOTAL:45 Periods**

|                         |                                                                                                                                                       |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Book:</b>       | 1. Literature: An Introduction to Fiction, Poetry, Drama, and Writing by X.J. Kennedy & Dana Gioia                                                    |
| <b>Reference Books:</b> | 1. How to Read Literature Like a Professor by Thomas C. Foster<br>2. Beginning Theory: An Introduction to Literary and Cultural Theory by Peter Barry |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                     | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Recall the fundamental elements of literature such as plot, character, setting, theme, and point of view.           | Understand (K2)      |
| <b>CO2</b>                                                | Apply literary terms and concepts to analyze a variety of genres, including fiction, poetry, and drama.             | Apply (K3)           |
| <b>CO3</b>                                                | Analyze how cultural, historical, and social contexts influence literary works and their interpretations.           | Analyze (K4)         |
| <b>CO4</b>                                                | Create well-organized written and oral analyses that demonstrate critical thinking and insight into literary texts. | Create (K6)          |
| <b>CO5</b>                                                | Compare and contrast different literary works and traditions to identify unique and shared features.                | Analyze (K4)         |

**V - Mapping Table - Mapping of COs with POs and PSOs**

| COs Vs POs/ PSOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO1</b>       | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| <b>CO2</b>       | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| <b>CO3</b>       | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| <b>CO4</b>       | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |
| <b>CO5</b>       | -    | -    | -    | -    | -    | -    | -    | -    | 2    | 3     | -     | 2     | -     | -     | -     |

Mapping: 1-Low, 2-Medium, 3-High

**XIII - PROFESSIONAL ELECTIVE COURSES: VERTICALS****I - Course Name: 23PAD02 - Exploratory Data Analysis**

| Prerequisite                          | Program Name                             | Sem      | Category | L | T | P | C |
|---------------------------------------|------------------------------------------|----------|----------|---|---|---|---|
| 23CS302 - Foundations of Data Science | B.E/B.Tech. – Common to CSE, IT, & AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|   |                                                                                                                         |
|---|-------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamental concepts and techniques of exploratory data analysis (EDA)                                 |
| 2 | To familiarize students with data visualization tools, particularly Matplotlib, for effective data                      |
| 3 | To enable students to conduct univariate data exploration, including descriptive statistics and visual analysis.        |
| 4 | To equip students with skills to analyze relationships between two variables using bivariate analysis techniques.       |
| 5 | To develop the ability to explore and visualize multivariate and time series datasets for insightful pattern discovery. |

**III - Course Content**

**Preamble:** This course introduces the core principles of Exploratory Data Analysis (EDA) and its role in data science. Students will learn to manipulate, visualize, and interpret data using Python tools like Pandas and Matplotlib. The course covers univariate, bivariate, multivariate, and time series analysis techniques. Real-world case studies enhance practical understanding and insight-driven exploration.

|                                                                                                                                                                                                                                                                                                                                               |                                              |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                               | <b>EXPLORATORY DATA ANALYSIS</b>             | <b>6 Periods</b> |
| EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.                                           |                                              |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                              | <b>EDA USING PYTHON</b>                      | <b>6 Periods</b> |
| Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations.                                                             |                                              |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                             | <b>UNIVARIATE ANALYSIS</b>                   | <b>6 Periods</b> |
| Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality.                                                                                                                                                                                                   |                                              |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                              | <b>BIVARIATE ANALYSIS</b>                    | <b>6 Periods</b> |
| Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines. Case Study: Analyzing Relationship Between Customer Age and Purchase Amount in a Retail Store.                                                                                          |                                              |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                               | <b>MULTIVARIATE AND TIME SERIES ANALYSIS</b> | <b>6 Periods</b> |
| Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling. Feature Engineering for Time Series Data Case Study: Sales Forecasting for an E-commerce Business. |                                              |                  |

**Total: 30 Periods**



**Practical Exercises:**

1. Install the data Analysis and Visualization tool: R/ Python /Tableau Public/ Power BI.
2. Perform exploratory data analysis (EDA) with datasets like email data set. Export all your emails as a dataset, import them inside a Pandas data frame, visualize them and get different insights from the data.
3. Working with Numpy arrays, Pandas data frames, Basic plots using Matplotlib.
4. Explore various variable and row filters in R for cleaning data. Apply various plot features in R on sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualization techniques.
6. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect, user interaction, etc.
7. Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India etc.
8. Perform EDA on Wine Quality Data Set.
9. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report.
10. Building an Interactive Dashboard for Data Visualization.

**Total: 30 Periods****Total Periods: 30+30 =60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020.<br>2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017                                                                                                             |
| <b>Reference Books:</b>    | 1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017<br>2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.<br>3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015. |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.swayam2.ac.in/ntr25_ed73/preview">https://onlinecourses.swayam2.ac.in/ntr25_ed73/preview</a>                                                                                                                                                                                                                              |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the fundamentals of exploratory data analysis.                                    | Understand (K2)      |
| <b>CO2</b>                                                | Implement the data visualization using Matplotlib                                            | Apply (K3)           |
| <b>CO3</b>                                                | Perform univariate data exploration and analysis                                             | Apply (K3)           |
| <b>CO4</b>                                                | Analyze bivariate data exploration and analysis.                                             | Apply (K3)           |
| <b>CO5</b>                                                | Analyze Data exploration and visualization techniques for multivariate and time series data. | Analyze (K4)         |



Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 2   | 1   | 2   | -   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 2    | 1    |
| CO2         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 2    | 2    |
| CO3         | 2   | 2   | 1   | 2   | -   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 2    | 1    |
| CO4         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 2    | 2    |
| CO5         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 2    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PAD06 - Recommender Systems**

| Prerequisite | Program Name                             | Sem      | Category | L | T | P | C |
|--------------|------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT and AIDS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|   |                                                                                                                        |
|---|------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand the fundamentals, types, and significance of recommender systems in real-world applications.             |
| 2 | To explore collaborative and content-based filtering techniques using various similarity measures.                     |
| 3 | To apply matrix factorization, hybrid models, and neural approaches like GNNs and NCF for recommendation.              |
| 4 | To address challenges such as cold start, sparsity, and bias while designing effective recommender                     |
| 5 | To evaluate recommendation models using standard metrics and analyze use cases from platforms like Netflix and Amazon. |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                     |                                                        |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------|
| <b>Preamble:</b> This course introduces the fundamentals and techniques of Recommender Systems used in domains like e-commerce and entertainment. It covers collaborative, content-based, and hybrid models, along with recent advancements like deep learning and GNNs. Students will learn to build, evaluate, and improve recommendation models using real-world data and tools. |                                                        |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                     | <b>Introduction to Recommender Systems</b>             | <b>6 Periods</b> |
| Definition and importance-Use cases: E-commerce, entertainment, social media-Types: Collaborative filtering, content-based filtering, hybrid systems-Challenges: cold start, sparsity, scalability-Graph Neural Networks (GNNs) for recommendation                                                                                                                                  |                                                        |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                    | <b>Similarity Measures and Collaborative Filtering</b> | <b>6 Periods</b> |
| User-user and item-item filtering-Cosine similarity, Jaccard similarity, Pearson correlation-Model-based vs. memory-based methods-Clustering and neighborhood models-Reinforcement Learning in Recommender Systems                                                                                                                                                                  |                                                        |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                   | <b>Content-Based Filtering and Feature Engineering</b> | <b>6 Periods</b> |
| User profiling and item profiling-Term Frequency-Inverse Document Frequency (TF-IDF)-Feature weighting and dimensionality reduction-Advantages and limitations of content-based models-Privacy and Bias Mitigation                                                                                                                                                                  |                                                        |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                    | <b>Matrix Factorization and Hybrid Systems</b>         | <b>6 Periods</b> |
| Latent factor models: SVD, NMF-Hybrid models: switching, feature combination, meta-level-Integration of knowledge-based and demographic recommenders-Neural Collaborative Filtering (NCF)                                                                                                                                                                                           |                                                        |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                     | <b>Evaluation and Advanced Topics</b>                  | <b>6 Periods</b> |
| Evaluation metrics: RMSE, MAE, Precision, Recall, NDCG, MAP-Cross-validation techniques-Recent                                                                                                                                                                                                                                                                                      |                                                        |                  |

advances: Deep learning, graph-based recommender systems-Case studies: Netflix, Amazon, Spotify.

**Total: 30 Periods**

#### PRACTICAL EXERCISES:

1. Build a basic movie recommendation engine using user ratings (MovieLens dataset)
2. Explore types of recommender systems using sample datasets
3. Implement user-user collaborative filtering
4. Implement item-item collaborative filtering using Cosine and Pearson similarity
5. Build a content-based recommender using TF-IDF for books/movies
6. Develop item profiles and compute similarities
7. Implement hybrid recommender: weighted combination of CF and CBF
8. Apply SVD/NMF for dimensionality reduction
9. Evaluate recommender system using MAE, RMSE, Precision, Recall, NDCG
10. A/B testing simulation for different algorithms

**Total: 30 Periods**

**Total Periods: 30+30 =60 Periods**

|                            |                                                                                                                                                                                                                                              |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.<br>2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich, Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed. |
| <b>Reference Books:</b>    | 1. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3 <sup>rd</sup> edition, Cambridge University Press, 2020                                                                                               |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.coursera.org/specializations/recommender-systems">https://www.coursera.org/specializations/recommender-systems</a>                                                                                                      |

#### IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                     | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Identify various types of recommender systems and the challenges in designing them. | Understand (K2)      |
| <b>CO2</b>                                                | Apply similarity metrics to implement collaborative and content-based filtering     | Apply (K3)           |
| <b>CO3</b>                                                | Analyze and evaluate matrix factorization and hybrid methods.                       | Apply (K3)           |
| <b>CO4</b>                                                | Design and implement a recommender model with real-world datasets.                  | Apply (K3)           |
| <b>CO5</b>                                                | Assess recommendation quality using suitable evaluation metrics.                    | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | 1    | -    | 2    | 2    | -    | 3    |
| CO2         | 3   | 3   | 2   | 2   | 3   | -   | -   | -   | -   | 2    | -    | 2    | 3    | 2    | 3    |
| CO3         | 3   | 2   | 3   | 2   | 3   | -   | -   | -   | -   | 2    | -    | 2    | 3    | 3    | 3    |
| CO4         | 3   | 3   | 3   | 3   | 3   | -   | -   | -   | 1   | 2    | 1    | 2    | 3    | 3    | 3    |
| CO5         | 3   | 3   | 2   | 3   | 3   | 2   | -   | 2   | 2   | 3    | 2    | 3    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PAD05 - Neural Networks and Deep Learning

| Prerequisite | Program Name                              | Sem      | Category | L | T | P | C |
|--------------|-------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, and AIDS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                                                       |
|---|-------------------------------------------------------------------------------------------------------|
| 1 | To understand the fundamentals, architectures, and applications of artificial neural networks.        |
| 2 | To explore associative memory models and unsupervised neural networks like SOM, LVQ, and ART.         |
| 3 | To apply advanced deep learning architectures such as CNNs, SNNs, and ELMs for computer vision tasks. |
| 4 | To implement deep feedforward neural networks using gradient-based optimization techniques.           |
| 5 | To understand and apply RNN architectures for temporal data, NLP, and image generation.               |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                   |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------------------|
| <b>Preamble:</b> This course offers an in-depth understanding of neural networks and advanced deep learning architectures. It covers foundational and cutting-edge topics such as associative memory models, convolutional and recurrent networks, autoencoders, and spiking neural networks. Students will gain hands-on experience in applying neural networks to real-world tasks in image processing and NLP using modern deep learning frameworks.              |                                                                   |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>INTRODUCTION</b>                                               | <b>6 Periods</b> |
| Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction Evolution of Neural Networks-Basic Models of Artificial Neural Network- Important Terminologies of ANNs-Supervised Learning – Network-Artificial Neural Network, activation function, multi-layer neural network.                                                                                                                                                    |                                                                   |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>ASSOCIATIVE MEMORY MODELS AND UNSUPERVISED NEURAL NETWORKS</b> | <b>6 Periods</b> |
| Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network- Case study of ImageNet challenge -LeNet, AlexNet. |                                                                   |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>ADVANCED NEURAL ARCHITECTURES</b>                              | <b>6 Periods</b> |
| Spiking Neural Networks-Convolutional Neural Networks (CNNs)-Deep Learning Neural Networks-Extreme Learning Machine Models-CNN Operations: Convolution, Pooling, and Variants-Applications: Computer Vision, Image Generation, Image Compression. Case study – Roi cropping in CT images and Cervical Images.                                                                                                                                                        |                                                                   |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>DEEP FEEDFORWARD NETWORKS</b>                                  | <b>6 Periods</b> |
| History of Deep Learning- A Probabilistic Theory of Deep Learning- Deep Feed Forward network, training deep models, dropouts-Gradient Learning – Chain Rule and Backpropagation – Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout – batch normalization- VC Dimension and Neural Nets.                                                                                                                                  |                                                                   |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>RECURRENT NEURAL NETWORKS</b>                                  | <b>6 Periods</b> |
| Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs -Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.-                                                                                                                                                         |                                                                   |                  |

Frameworks for Deep Learning - PyTorch, TensorFlow, Keras, Theano, Caffe, Nvidia DGX machines for DL applications.

**Total: 30 Periods**

#### PRACTICAL EXERCISES:

1. Implement a simple perceptron for a binary classification problem.
2. Build and train an MLP on a dataset (e.g., Iris or MNIST subset).
3. Manually implement backpropagation for a small neural network.
4. Use frameworks like TensorFlow or PyTorch to build deeper networks.
5. Implement a CNN for image classification using datasets like MNIST or CIFAR-10.
6. Implement simple RNN and LSTM models for sequence prediction (e.g., text generation or time series forecast).
7. Build undercomplete autoencoders for dimensionality reduction or denoising.
8. Use pre-trained models (e.g., VGG, ResNet) for image classification tasks.
9. Implement a basic GAN for image generation.
10. Evaluate model performance using accuracy, precision, recall, confusion matrix.

**Total: 30 Periods**

**Total Periods: 30+30 =60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. François Chollet, Deep Learning with Python, 2nd Edition, Manning Publications, 2021.<br>2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.                                                                                                                                                       |
| <b>Reference Books:</b>    | 1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly, 2018.<br>2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.<br>3. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 1st Edition, 2018. |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.coursera.org/learn/introduction-Neural">https://www.coursera.org/learn/introduction-Neural</a>                                                                                                                                                                                                                  |

#### IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                      | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the basics of neural networks and learning rules of deep neural networks. | Understand (K2)      |
| CO2                                                       | Understand and implement associative memory and unsupervised learning networks.      | Understand (K2)      |
| CO3                                                       | Apply the CNN variants for suitable applications.                                    | Apply (K3)           |
| CO4                                                       | Analyze and train deep neural networks for various tasks.                            | Apply (K3)           |
| CO5                                                       | Analyze autoencoders and generative models effectively                               | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 2   | 1   | 2   | -   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 2    | 1    |
| CO2         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 2    | 2    |
| CO3         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 3    | 2    |
| CO4         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 3    | 3    | 2    |
| CO5         | 2   | 2   | 2   | 2   | 3   | -   | -   | -   | 1   | 3    | 2    | 2    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23PAD07 - Text and Speech Analysis

| Prerequisite | Program Name                              | Sem      | Category | L | T | P | C |
|--------------|-------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, and AIDS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                             |
|---|-----------------------------------------------------------------------------|
| 1 | Understand the basics of how computers process text and speech.             |
| 2 | Learn common tools and models used in NLP and speech applications.          |
| 3 | Apply machine learning and deep learning to solve text and speech problems. |
| 4 | Build simple systems for tasks like speech recognition and text-to-speech.  |
| 5 | Evaluate how well NLP and speech systems perform.                           |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                            |                                           |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------|
| <b>Preamble:</b> This course introduces the fundamental concepts of Natural Language and Speech Processing. It covers core techniques for analyzing and modeling text and speech data, including preprocessing, classification, recognition, and synthesis. Learners will gain hands-on experience with tools like NLTK, spaCy, and Praat to build real-world NLP and speech applications. |                                           |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                            | <b>Foundations of Text and Speech</b>     | <b>6 Periods</b> |
| Foundations of Natural Language Processing (NLP) - Levels of NLP: Morphological, Syntactic, Semantic. Basics of Speech Production and Phonetics - Structural comparison of text vs. speech - Regular Expressions in NLP -Tools introduction: NLTK, spaCy, Praat                                                                                                                            |                                           |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>Text Processing and Representation</b> | <b>6 Periods</b> |
| Text preprocessing: Tokenization, Stop-word Removal, Stemming, Lemmatization - Feature Representation: Bag of Words, N-Grams, TF-IDF - Word Embeddings: Word2Vec, GloVe, FastText -Text Classification: Naive Bayes, SVM - Overview of Deep Learning Models: RNN, Transformers - Introduction to Topic Modeling and Text Summarization                                                     |                                           |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                          | <b>Integrated Text and Speech Systems</b> | <b>6 Periods</b> |
| Question Answering Systems: IR-based, Knowledge-based, Language model-based QA -Dialogue Systems and chatbots - Named Entity Recognition using CRF, LSTM -WordNet and Word Sense Disambiguation                                                                                                                                                                                            |                                           |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>Speech Analysis and Recognition</b>    | <b>6 Periods</b> |
| Basics of Speech Signals and Phonetic Features - Feature Extraction: MFCC, LPC, PLP, GFCC - Acoustic Models: HMM, DNN-HMM, DTW - Speech Recognition Pipeline: Viterbi Algorithm, CTC - ASR Evaluation: Word Error Rate                                                                                                                                                                     |                                           |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                            | <b>Text-to-Speech (TTS) Synthesis</b>     | <b>6 Periods</b> |
| TTS Pipeline: Text Normalization - Phoneme Conversion - Audio generation ,TTS Approaches: Concatenative, Parametric, Deep Learning-based (Tacotron, WaveNet), Vocoding and Spectrogram Generation, Evaluation Metrics for TTS: MOS Score                                                                                                                                                   |                                           |                  |

Total: 30 Periods

**PRACTICAL EXERCISES:**

1. Text Cleaning and Preprocessing
2. Text Representation using Bag of Words and TF-IDF
3. Word Embeddings using Word2Vec
4. Named Entity Recognition (NER)
5. Basic Speech Signal Visualization and MFCC Extraction
6. Simple Automatic Speech Recognition (ASR) using Pretrained
7. Text-to-Speech Conversion using pyttsx3

**Total: 30 Periods****Total Periods: 30+30 =60 Periods**

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | <ol style="list-style-type: none"> <li>1. Daniel Jurafsky and James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, 3rd Draft Edition, 2021.</li> <li>2. Steven Bird, Ewan Klein, and Edward Loper, Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit, O'Reilly Media, 2009.</li> <li>3. Lawrence R. Rabiner and Ronald W. Schafer, Theory and Applications of Digital Speech Processing, Pearson, 2010.</li> </ol>                                                                                                                                                                                                                                                                                                                                                         |
| <b>Reference Books:</b> | <ol style="list-style-type: none"> <li>1. John Atkinson-Abutridy, Text Analytics: An Introduction to the Science and Applications of Unstructured Information Analysis, CRC Press, 2022.</li> <li>2. Jim Schwoebel, Introduction to Voice Computing in Python, NeuroLex, 2018.</li> <li>3. Lawrence Rabiner, Bing-Hwang Juang, and B. Yegnanarayana, Fundamentals of Speech Recognition, Pearson, 2009.</li> <li>4. Bhargav Srinivasa-Desikan, Natural Language Processing and Computational Linguistics: A Practical Guide to Text Analysis with Python, Gensim, spaCy, and Keras, Packt Publishing, 2018.</li> <li>5. Dipanjan Sarkar, Text Analytics with Python: A Practical Real-World Approach to Gaining Actionable Insights from Your Data, APress, 2018.</li> <li>6. Tanveer Siddiqui and U. S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.</li> </ol> |

  
**Chairperson-Board of Studies,**  
**Department of Information Technology,**  
**NPR College of Engineering & Technology**  
**(Autonomous),**  
**Natham, Dindigul 624401**

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the structure and meaning of text using rule-based and statistical methods. | Understand (K2)      |
| <b>CO2</b>                                                | Use machine learning models to classify text and recognize named entities.             | Apply (K3)           |
| <b>CO3</b>                                                | Apply question answering and chatbot systems using language models.                    | Analyze (K4)         |
| <b>CO4</b>                                                | Process speech signals and build basic speech recognition systems.                     | Analyze (K4)         |
| <b>CO5</b>                                                | Analyze a text-to-speech system using modern techniques.                               | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | -    | -    | 3    | 2    | 2    |
| <b>CO2</b>  | 3   | 3   | 2   | 2   | 3   | -   | -   | -   | 1   | 2    | -    | -    | 3    | 3    | 2    |
| <b>CO3</b>  | 2   | 2   | 3   | 2   | 3   | 1   | -   | 1   | 3   | 3    | 2    | 2    | 3    | 3    | 3    |
| <b>CO4</b>  | 2   | 2   | 3   | 2   | 3   | -   | -   | -   | 2   | 2    | 1    | 2    | 3    | 2    | 3    |
| <b>CO5</b>  | 2   | 2   | 3   | 2   | 3   | -   | 1   | 1   | 2   | 2    | 1    | 2    | 3    | 2    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401

**I - Course Name: 23PAD01 - Business Analytics**

| Prerequisite | Program Name                              | Sem      | Category | L | T | P | C |
|--------------|-------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, and AIDS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|   |                                                                                                                                      |
|---|--------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Introduce the fundamentals and characteristics of Business Analytics and its role in decision-making.                                |
| 2 | To differentiate between Business Intelligence, Business Analytics, and understand the data science process.                         |
| 3 | To equip students with knowledge of data management, preprocessing, integration, and modern data platforms.                          |
| 4 | To develop skills in applying Descriptive, Predictive, and Prescriptive analytics using statistical and machine learning techniques. |
| 5 | To enable learners to use analytics tools like Excel, Python, Power BI, and Tableau across various business functions                |

**III - Course Content**

**Preamble:** Business Analytics empowers organizations to make data-driven decisions by analyzing business data. This course covers Descriptive, Predictive, and Prescriptive analytics with real-world applications. Students will learn data management, data science processes, and visualization using tools like Power BI and Tableau.

|                                                                                                                                                                                                                              |                                           |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                              | <b>INTRODUCTION TO BUSINESS ANALYTICS</b> | <b>6 Periods</b> |
| Introduction to Business Analytics – Characteristics – Business Intelligence vs Business Analytics – Data science process – Descriptive Analytics. Emerging trends in analytics, Applications in finance, marketing, and HR. |                                           |                  |
| <b>Unit – II</b>                                                                                                                                                                                                             | <b>BUSINESS INTELLIGENCE</b>              | <b>6 Periods</b> |
| Data Management – Data quality, Data integration – Data pre-processing – ETL – Data warehouses. Cloud-based data platforms, Data lakes, NoSQL databases.                                                                     |                                           |                  |
| <b>Unit – III</b>                                                                                                                                                                                                            | <b>BUSINESS FORECASTING</b>               | <b>6 Periods</b> |
| Predictive Analytics – Regression analysis, Logistic regression, Time series analysis, Forecasting models. Decision trees, Random Forest, Gradient boosting.                                                                 |                                           |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                             | <b>HR &amp; SUPPLY CHAIN ANALYTICS</b>    | <b>6 Periods</b> |
| Prescriptive Analytics – Optimization, Linear programming, Simulation, Decision analysis. Heuristic optimization, Solver tools in Excel and Python.                                                                          |                                           |                  |
| <b>Unit – V</b>                                                                                                                                                                                                              | <b>MARKETING &amp; SALES ANALYTICS</b>    | <b>6 Periods</b> |
| Business Analytics applications – Marketing, Financial, HR, and Supply Chain Analytics. AI in Business Analytics, Dashboards, Power BI/Tableau tools.                                                                        |                                           |                  |

**Total: 30 Periods**



**PRACTICAL EXERCISES:**

Use MS-Excel and Power-BI to perform the following experiments using a business data set, and make presentations. Students may be encouraged to bring their own real-time socially relevant data set.

**I Cycle – MS Excel**

1. Explore the features of Ms-Excel.
2. (i) Get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND)  
(ii) Perform data import/export operations for different file formats.
3. Perform statistical operations - Mean, Median, Mode and Standard deviation, Variance, Skewness, Kurtosis
4. Perform Z-test, T-test & ANOVA
5. Perform data pre-processing operations i) Handling Missing data ii) Normalization
6. Perform dimensionality reduction operation using PCA, KPCA & SVD
7. Perform bivariate and multivariate analysis on the dataset.
8. Apply and explore various plotting functions on the data set.

**II Cycle – Power BI Desktop**

9. Explore the features of Power BI Desktop
10. Prepare & Load data
11. Develop the data model
12. Perform DAX calculations
13. Design a report
14. Create a dashboard and perform data analysis
15. Presentation of a case study

**Total: 30 Periods**

**Total Periods: 30+30 =60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. R. Evans James, Business Analytics, 2nd Edition, Pearson, 2017</li> <li>2. R N Prasad, Seema Acharya, Fundamentals of Business Analytics, 2nd Edition, Wiley, 2016</li> <li>3. Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016</li> <li>4. VSP RAO, Human Resource Management, 3rd Edition, Excel Books, 2010.</li> <li>5. Mahadevan B, "Operations Management -Theory and Practice", 3rd Edition, Pearson Education, 2018.</li> </ol>                |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. U. Dinesh Kumar, Foster Provost, Tom Fawcett, Data Science for Business, O'Reilly, 2021.</li> <li>2. S. Christian Albright, Wayne Winston, Business Analytics: Data Analysis and Decision Making, Cengage, 2022.</li> <li>3. Chris Anderson, Analytics in Practice: A Guide for Business Managers, Pearson, 2019.</li> <li>4. Wes McKinney, Python for Data Analysis, O'Reilly, 2023.</li> <li>5. Anil Maheshwari, Data Analytics Made Accessible, Amazon Digital, 2022.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.swayam2.ac.in/ntr25_ed73/preview">https://onlinecourses.swayam2.ac.in/ntr25_ed73/preview</a>                                                                                                                                                                                                                                                                                                                                                                                                   |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the fundamentals of business analytics and its scope.              | Understand (K2)      |
| CO2                                                       | Perform data preprocessing and manage data for analytics tasks.               | Apply (K3)           |
| CO3                                                       | Apply predictive modelling techniques for business forecasting                | Apply (K3)           |
| CO4                                                       | Use optimization and prescriptive tools for business decisions.               | Apply (K3)           |
| CO5                                                       | Analyze dashboards and use BI tools for data visualization and interpretation | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 2   | 1   | 2   | -   | 1   | 1   | -   | 1   | 2    | -    | 2    | 2    | 2    | 1    |
| CO2         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 2    | 2    |
| CO3         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 3    | 2    |
| CO4         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 3    | 3    | 2    |
| CO5         | 2   | 2   | 2   | 2   | 3   | -   | -   | -   | 1   | 3    | 2    | 2    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PAD04 - Image and Video Analytics

| Prerequisite | Program Name                              | Sem      | Category | L | T | P | C |
|--------------|-------------------------------------------|----------|----------|---|---|---|---|
| -            | B.E/B.Tech. – Common to CSE, IT, and AIDS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| 1 | To understand the fundamentals of image and video representation and processing.             |
| 2 | To apply modern deep learning models for object detection, segmentation, and classification. |
| 3 | To explore generative and transformer-based models for image and video synthesis.            |
| 4 | To design real-time video analytics pipelines using standard tools and frameworks.           |
| 5 | To investigate self-supervised and few-shot learning approaches in visual understanding      |

## III - Course Content

**Preamble:** This course provides students with foundational and advanced concepts of image and video analytics. It covers data representation, feature extraction, object detection, deep learning models, and real-time analytics. Learners gain hands-on experience with industry tools, deep generative models, and emerging techniques such as transformers and self-supervised learning.

|                                                                                                                                                                                              |                                                     |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                              | <b>FOUNDATIONS OF IMAGE AND VIDEO ANALYTICS</b>     | <b>6 Periods</b> |
| Visual sensing and camera models – Image and video representation – Tools: OpenCV, PIL, skimage – Color models – Filtering and edge detection – Frame extraction and compression techniques. |                                                     |                  |
| <b>Unit – II</b>                                                                                                                                                                             | <b>VISUAL FEATURES AND SELF-SUPERVISED LEARNING</b> | <b>6 Periods</b> |
| Feature descriptors: ORB, SIFT, HOG – Optical flow methods – Self-supervised learning (SimCLR, DINO) – Applications in low-data environments.                                                |                                                     |                  |
| <b>Unit – III</b>                                                                                                                                                                            | <b>OBJECT DETECTION USING MACHINE LEARNING</b>      | <b>6 Periods</b> |
| CNN and Vision Transformer models – DETR, Segment Anything Model (SAM), CLIP – Object detection frameworks: YOLO, R-CNN.                                                                     |                                                     |                  |
| <b>Unit – IV</b>                                                                                                                                                                             | <b>GENERATIVE VISION AND VIDEO MODELS</b>           | <b>6 Periods</b> |
| GANs (StyleGAN, CycleGAN) – Diffusion models – Video synthesis – Prompt-based generation – Applications in editing and enhancement.                                                          |                                                     |                  |
| <b>Unit – V</b>                                                                                                                                                                              | <b>APPLICATIONS, DEPLOYMENT &amp; TRENDS</b>        | <b>6 Periods</b> |
| Action recognition (SlowFast, MoViNet) – Edge device analytics – Anomaly detection – Explainable AI – Trends: NeRF, Multimodal AI.                                                           |                                                     |                  |

Total: 30 Periods

## PRACTICAL EXERCISES:

1. Write a program that computes the T-pyramid of an image.
2. Write a program that derives the quad tree representation of an image using the homogeneity criterion of equal intensity
3. Develop programs for the following geometric transforms: (a) Rotation (b) Change of scale (c) Skewing (d) Affine transform calculated from three pairs of corresponding points (e) Bilinear transform calculated from four

pairs of corresponding points.

4. Develop a program to implement Object Detection and Recognition
5. Develop a program for motion analysis using moving edges, and apply it to your image sequences.
6. Develop a program for Facial Detection and Recognition
7. Write a program for event detection in video surveillance system

**Total:** 30 Periods

**Total Periods:** 30+30 =60 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", 4nd edition, Thomson Learning, 2013.<br>2. Vaibhav Verdhhan, (2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras, Apress 2021 (UNIT-III, IV and V)                                                                                                                                    |
| <b>Reference Books:</b>    | 1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London 2. Limited, 2011.<br>2. Caifeng Shan, Fatih Porikli, Tao Xiang, Shaogang Gong, "Video Analytics for Business Intelligence", Springer, 2012.<br>3. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003<br>4. E. R. Davies, (2012), "Computer & Machine Vision", Fourth Edition, Academic Press. |
| <b>MOOC/Web Platforms:</b> |                                                                                                                                                                                                                                                                                                                                                                                                                               |

#### IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                   | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand image and video data representations and processing pipelines          | Understand (K2)      |
| <b>CO2</b>                                                | Apply modern deep learning architectures for visual recognition and segmentation. | Apply (K3)           |
| <b>CO3</b>                                                | Implement generative and transformer-based models for image and video synthesis.  | Apply (K3)           |
| <b>CO4</b>                                                | Design and evaluate real-time analytics pipelines using industry tools.           | Apply (K3)           |
| <b>CO5</b>                                                | Explore self-supervised and few-shot learning paradigms for visual understanding. | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 2   | 1   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 2    | 1    |
| CO2         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 2    | 2    |
| CO3         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 2    | 3    | 2    |
| CO4         | 2   | 2   | 2   | 2   | 2   | -   | -   | -   | 1   | 2    | 1    | 2    | 3    | 3    | 2    |
| CO5         | 2   | 2   | 2   | 2   | 3   | -   | -   | -   | 1   | 3    | 2    | 2    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PAD902 COMPUTER VISION

| Prerequisite | Program Name                              | Sem | Category | L | T | P | C |
|--------------|-------------------------------------------|-----|----------|---|---|---|---|
| -            | B.E/B.Tech. – Common to CSE, IT, and AIDS | V   | PEC      | 3 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                                                                                              |
|----|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To introduce the fundamental concepts of computer vision, including image formation and basic image processing techniques.                   |
| 2. | To equip students with techniques for feature extraction and image segmentation to enable meaningful interpretation of visual data.          |
| 3. | To provide practical exposure to machine learning and neural network algorithms used in computer vision tasks.                               |
| 4. | To develop analytical skills to handle 3D vision tasks such as stereo vision, motion estimation, and scene reconstruction.                   |
| 5. | To enable students to design and evaluate deep learning models for advanced vision applications like object detection and real-time systems. |

## III - Course Content

**Preamble:** The Computer Vision course introduces core concepts of image formation, processing, and analysis. Students learn feature extraction, segmentation, and object recognition using classical and deep learning methods. The course covers 2D/3D vision tasks, motion analysis, and real-world applications like surveillance and autonomous driving. Emerging trends like vision transformers and self-supervised learning are also explored.

|                                                                                                                                                                                                                                                                                                                                                                                                                |                                                  |                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------------|
| <b>UNIT-I</b>                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Introduction and Image Processing</b>         | <b>6 Hours</b> |
| Introduction to Computer Vision: Definition, Scope, Applications, Recent Trends-Basic Image Processing: Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Global optimization-Case Study: Preprocessing Satellite Images for Agricultural Analysis |                                                  |                |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Feature Extraction and Image Segmentation</b> | <b>6 Hours</b> |
| Edge Detection: Canny Edge Detector-Corner Detection: Harris and Shi-Tomasi- Feature Matching Techniques and Applications (Object Tracking, AR)-Image Segmentation Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation Case Study: Automatic Crack Detection in Pavement Images                                                                           |                                                  |                |
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                | <b>Deep Learning for Computer Vision</b>         | <b>6 Hours</b> |
| CNN Basics and Architecture-Image Classification with CNN-Transfer Learning (VGG, ResNet)-Image Segmentation (Mask R-CNN, U-Net Overview)-Real-Time Applications: Gesture Recognition, OCR, Face Recognition -Case Study: Face Mask Detection using CNNs                                                                                                                                                       |                                                  |                |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                    |                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|----------------|
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>3D RECONSTRUCTION</b>                           | <b>6 Hours</b> |
| 3D Reconstruction: Shape from X - Active range finding - Surface representations - Point-based representations<br>Volumetric representations - Model-based reconstruction - Recovering texture maps -Case Study: 3D<br>Reconstruction of Indoor Scenes using SfM                                                                                                                                                                    |                                                    |                |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Advanced Vision Techniques and Applications</b> | <b>6 Hours</b> |
| Object Detection and Recognition: R-CNN, Fast R-CNN, YOLO, SSD, Face Detection & Recognition-Semantic and<br>Instance Segmentation: SegNet-Video Processing and Action Recognition: Optical Flow in Video, Activity<br>Recognition, Object Tracking in Videos-Recent Trends: Zero-shot and Few-shot Learning, Self-supervised Learning,<br>Vision Transformers. Case Study: Autonomous Vehicle Perception using YOLO and Mask R-CNN |                                                    |                |

**Total : 30 Hours****LIST OF EXPERIMENTS:**

1. OpenCV Installation and Basic Image Operations (load, crop, resize, thresholding)
2. Image Annotation (drawing lines, text, shapes)
3. Image Enhancement (color spaces, histogram equalization, smoothing, edge detection)
4. Feature Detection and Matching (ORB, SIFT, SURF, feature alignment)
5. Image Segmentation (Graphcut / Grabcut methods)
6. Camera Calibration (circular grid method)
7. Pose Estimation
8. 3D Reconstruction from multiple views/stereo images
9. Creating Depth Map from Stereo Images
10. Object Detection and Tracking (Kalman Filter, Camshift)

**Total : 30 Hours****Total : 30 + 30 = 60 Hours**

|                            |                                                                                                                                                                                                                                                                                                                         |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Texts in Computer Science, Second Edition, 2022.<br>2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.                                                                             |
| <b>Reference Books:</b>    | 1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.<br>2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006<br>3. E.R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012. |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc25_cs143/preview">https://onlinecourses.nptel.ac.in/noc25_cs143/preview</a>                                                                                                                                                                                               |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                 | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain the fundamentals of computer vision, image formation, and basic image processing operations             | Understand (K2)      |
| CO2                                                       | Apply feature extraction and segmentation techniques to analyze and interpret image data                        | Apply (K3)           |
| CO3                                                       | Implement machine learning and neural network algorithms for visual recognition tasks                           | Apply (K3)           |
| CO4                                                       | Analyze 3D vision tasks such as stereo imaging, motion estimation, and structure from motion                    | Apply (K3)           |
| CO5                                                       | Develop and evaluate deep learning models for object detection, segmentation, and real-time vision applications | Apply (K3)           |

(Action verb of each CO to be matched with the next mapping table)

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO1         | 2    | 2    | 1    | 2    | 2    | -    | -    | 1    | 2    | 1     | 2     | 2     | 2     | 1     | 2     |
| CO2         | 2    | 2    | 2    | 2    | 2    | -    | -    | 1    | 2    | 1     | 2     | 2     | 2     | 2     | 2     |
| CO3         | 2    | 2    | 2    | 2    | 2    | -    | -    | 1    | 2    | 1     | 2     | 2     | 2     | 2     | 2     |
| CO4         | 2    | 2    | 2    | 2    | 2    | -    | -    | 1    | 2    | 1     | 2     | 2     | 2     | 2     | 2     |
| CO5         | 2    | 2    | 2    | 2    | 2    | -    | -    | 1    | 2    | 1     | 2     | 2     | 2     | 2     | 2     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23PAD01 - Big Data Analytics

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                                                                                           |
|---|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Students will learn to trace the evolution of Big Data platforms, and identify components used in modern Big Data applications.           |
| 2 | Students will compare different NoSQL database types (e.g. key-value, document, graph, column-family) and apply schema design strategies. |
| 3 | Students will develop and test data processing jobs using MapReduce and Spark frameworks.                                                 |
| 4 | Students will manage data storage effectively using HDFS and modern file systems.                                                         |
| 5 | Students will use tools such as HBase, Hive, Pig, Flink, and NiFi to build scalable data analytics and processing pipelines.              |

## III - Course Content

**Preamble:** To successfully learn this course, students are expected to have a solid foundation in Data Structures, Database Management Systems, Operating Systems, and Computer Networks. They should be familiar with basic programming concepts in C/Python/Java, along with knowledge of SQL queries and object-oriented programming principles. A prior understanding of cloud computing basics, probability and statistics, and problem-solving skills will help in grasping analytical and distributed processing concepts.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                    |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>FOUNDATIONS OF BIG DATA AND EMERGING TRENDS</b> | <b>6 Periods</b> |
| Introduction to Big Data – Definition, Characteristics (Volume, Velocity, Variety, Veracity, Value)-Convergence of Key Trends: IoT, AI, Cloud, Edge Computing-Types of Data: Structured, Semi-structured, Unstructured-Real-world Applications of Big Data in Healthcare, Finance, Retail, and Smart Cities-Web and Social Media Analytics – Sentiment Analysis, Clickstream Analytics-Introduction to Big Data Platforms – Hadoop Ecosystem Overview-Introduction to Edge and Fog Computing in Big Data-Role of Generative AI in Big Data Analysis |                                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>NoSQL DATABASES AND DATA MODELS</b>             | <b>6 Periods</b> |
| Introduction to NoSQL: Concepts, Types, Use Cases-Key-Value Stores, Document Databases, Column-family, Graph Databases-Modern NoSQL Systems: MongoDB, Neo4j, Amazon DynamoDB-Schema Evolution and Schemaless Design Principles-Data Replication and Consistency: CAP Theorem-Introduction to Time-Series Databases and Use in Real-time Analytics-Overview of Apache Cassandra: Data Model and Use Cases-Introduction to Database Sharding and Horizontal Scalability                                                                               |                                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>DATA PROCESSING WITH HADOOP AND SPARK</b>       | <b>6 Periods</b> |
| MapReduce Programming Model – Concepts, Workflows-Job Execution in Hadoop YARN-Advanced Data Processing: Apache Spark Overview and Comparison with MapReduce-RDDs and DataFrames in Spark – Basic Transformations and Actions-Spark SQL and Integrating with Hive-Testing and Debugging with MRUnit and Spark Testing Tools-Fault Tolerance and Job Scheduling in Distributed Systems-Introduction to PySpark and Real-time Data Processing with Spark Streaming                                                                                    |                                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>BIG DATA STORAGE</b>                            | <b>6 Periods</b> |
| Data Formats: JSON, XML, Avro, Parquet, ORC-Hadoop Distributed File System (HDFS) – Architecture, Data Flow, Fault Tolerance-Compression Techniques and Performance Optimization in Hadoop-Serialization in Hadoop – Avro and Protocol Buffers-Introduction to Delta Lake and Lakehouse Architecture-HDFS vs Cloud                                                                                                                                                                                                                                  |                                                    |                  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                      |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------------------|
| Storage Systems – AWS S3, Google Cloud Storage-Hadoop and Cassandra Integration – Use Cases and Performance Trade-offs-Introduction to Iceberg and Apache Arrow for Efficient Data Analytic                                                                                                                                                                                                                                                           |                                      |                  |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>BIG DATA TOOLS AND FRAMEWORKS</b> | <b>6 Periods</b> |
| Apache HBase: Architecture, Data Model, Client API, Use Cases-Hive: HiveQL – DDL, DML, Querying, UDFs-Apache Pig: Grunt Shell, Pig Latin, Complex Data Types, Scripts-Introduction to Apache Flink – Real-time Stream Processing-Data Integration Tools – Apache NiFi, Apache Airflow-Big Data Visualization – Integrating with Power BI, Tableau-Overview of Kubernetes and Docker for Big Data Deployments-Ethics and Privacy in Big Data Analytics |                                      |                  |

**Total: 30 Periods****PRACTICAL EXERCISES:**

1. Download and install Hadoop in pseudo-distributed mode; run startup scripts and explore configuration files.
2. Perform file management tasks in Hadoop: add, retrieve, and delete files/directories using HDFS commands.
3. Implement Matrix Multiplication using Hadoop MapReduce.
4. Run a Word Count MapReduce program to understand the MapReduce paradigm.
5. Install Hive and create tables to run practice queries including joins and partitions.
6. Install HBase and Thrift; perform basic CRUD operations using HBase shell and REST API.
7. Use Apache Sqoop to import data from a MySQL database into Hadoop and export data back to MySQL

**Total: 30 Periods****Total Periods: 30+30 =60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.<br>2. Eric Sammer, "Hadoop Operations", O'Reilly, 2012.<br>3. Sadalage, Pramod J. "NoSQL distilled", 2013                                                                  |
| <b>Reference Books:</b>    | 1. Tom White, Hadoop: The Definitive Guide, 4th Edition, O'Reilly Media, 2020<br>2. Chuck Lam, Hadoop in Action, 2nd Edition, Manning Publications, 2021<br>3. Holden Karau et al., Learning Spark: Lightning-Fast Big Data Analysis, 2nd Edition, O'Reilly Media, 2020<br>4. Jules S. Damji et al., Spark: The Definitive Guide, O'Reilly Media, 2020 |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc25_cs131/preview">https://onlinecourses.nptel.ac.in/noc25_cs131/preview</a>                                                                                                                                                                                                                              |

  
**Chairperson-Board of Studies,**  
**Department of Information Technology,**  
**NPR College of Engineering & Technology**  
**(Autonomous),**  
**Natham, Dindigul 624401**

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the evolution and components of Big Data platforms, including modern applications. | Understand (K2)      |
| CO2                                                       | Compare and apply NoSQL databases and schema design strategies.                               | Understand (K2)      |
| CO3                                                       | Develop and test data processing jobs using MapReduce and Spark.                              | Apply (K3)           |
| CO4                                                       | Manage data storage using HDFS and modern file systems                                        | Apply (K3)           |
| CO5                                                       | Use tools like HBase, Hive, Pig, Flink, and NiFi for scalable data analytics and processing.  | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | -   | 2   | -   | -   | 1   | -   | -   | -    | -    | 2    | -    | -    | 3    |
| CO2         | 3   | 3   | -   | 2   | -   | -   | -   | -   | -   | -    | -    | 3    | -    | -    | 3    |
| CO3         | 2   | 3   | -   | 3   | -   | -   | -   | -   | -   | -    | -    | 3    | -    | -    | 2    |
| CO4         | 2   | 2   | -   | 3   | -   | -   | -   | -   | -   | -    | -    | 2    | -    | -    | 2    |
| CO5         | 2   | 3   | -   | 3   | -   | -   | -   | -   | -   | -    | -    | 3    | -    | -    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401

**I - Course Name: 23CS905 - CLOUD COMPUTING**

| Prerequisite                | Program Name                               | Sem      | Category | L | T | P | C |
|-----------------------------|--------------------------------------------|----------|----------|---|---|---|---|
| 23CS404 - Operating Systems | B.E/B.Tech. – Common to CSE, IT, and AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|   |                                                                               |
|---|-------------------------------------------------------------------------------|
| 1 | To understand the principles of cloud architecture, models and infrastructure |
| 2 | To understand the concepts of virtualization and virtual machines.            |
| 3 | To gain knowledge about virtualization Infrastructure                         |
| 4 | To explore and experiment with various Cloud deployment environments          |
| 5 | To learn about the security issues in the cloud environment.                  |

**III - Course Content**

**Preamble:** This course provides a comprehensive understanding of cloud computing concepts, focusing on architecture models, virtualization, storage, deployment environments, and security. It explores foundational topics like cloud service and deployment models, virtualization techniques, and cloud infrastructure design challenges. Additionally, the course covers practical tools and case studies, including Docker, Hadoop, and major cloud platforms, alongside strategies to ensure cloud security and privacy.

|                                                                                                                                                                                                                                                                                                                       |                                                     |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                       | <b>CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE</b> | <b>6 Periods</b> |
| Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models- Cloud Infrastructure– Design Challenges                                                                                                         |                                                     |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                      | <b>VIRTUALIZATION BASICS</b>                        | <b>6 Periods</b> |
| Virtual Machine – Hypervisor – Key Concepts – Virtualization structure – Virtualization Types: Full Virtualization – Para Virtualization– Hardware Virtualization- Implementation levels of virtualization – Desktop Virtualization – Network Virtualization – Storage Virtualization Case Study: Netflix and Amazon. |                                                     |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                     | <b>CLOUD STORAGE AND DOCKER</b>                     | <b>6 Periods</b> |
| Cloud Storage-Storage-as-a-Service-Advantages of Cloud Storage-Cloud Storage Providers- Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.                                                                                                                               |                                                     |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                      | <b>CLOUD DEPLOYMENT ENVIRONMENT</b>                 | <b>7 Periods</b> |
| Cloud deployment -Hadoop-MapReduce-Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus- OpenStack.                                                                                                                                                                             |                                                     |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                       | <b>CLOUD SECURITY</b>                               | <b>5 Periods</b> |
| Security and Privacy in Cloud-Specific Attacks: Guest hopping – VM migration attack – hyper jacking. Identity and Access Management (IAM) - IAM Architecture and Practice                                                                                                                                             |                                                     |                  |

**TOTAL: 30 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**PRACTICAL EXERCISES:**

1. Install Virtualbox/VMware/ Equivalent open-source cloud Workstation with different flavours of Linux or Windows OS on top of windows 8 and above.
2. Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs
3. Install Google App Engine to launch the web applications.
4. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
5. Find a procedure to transfer the files from one virtual machine to another virtual machine.
6. Install Hadoop single node cluster and run simple applications.
7. Creating and Executing a Container Using Docker.

**Total: 30 Periods****Total Periods: 30+30 =60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.<br>2. James Turnbull, "The Docker Book", O'Reilly Publishers, 2014.<br>3. Krutz, R. L., Vines, R. D, "Cloud security. A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, 2010 |
| <b>Reference Books:</b>    | 1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.<br>2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy: an enterprise perspective on risks and compliance", O'Reilly Media, Inc., 2009.                                                                   |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc25_cs11/preview">https://onlinecourses.nptel.ac.in/noc25_cs11/preview</a>                                                                                                                                                                                                                                                |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                          | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the design challenges in the cloud.                           | Understand (K2)      |
| <b>CO2</b>                                                | Apply the concept of virtualization and its types.                       | Apply (K3)           |
| <b>CO3</b>                                                | Experiment with virtualization of hardware resources and Docker.         | Apply (K3)           |
| <b>CO4</b>                                                | Develop and deploy services on the cloud and set up a cloud environment. | Apply (K3)           |
| <b>CO5</b>                                                | Analyze various security challenges in the cloud environment.            | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 1   | 1   | 1   | -   | -   | -   | 2   | 3    | 1    | 3    | 2    | 2    | 1    |
| CO2         | 3   | 1   | 2   | 2   | 1   | -   | -   | -   | 1   | 2    | 1    | 3    | 3    | 2    | 2    |
| CO3         | 2   | 3   | 2   | 3   | 1   | -   | -   | -   | 3   | 1    | 1    | 3    | 2    | 3    | 2    |
| CO4         | 1   | 2   | 3   | 3   | 3   | -   | -   | -   | 3   | 3    | 1    | 2    | 2    | 3    | 2    |
| CO5         | 2   | 3   | 3   | 1   | 3   | -   | -   | -   | 2   | 2    | 1    | 2    | 3    | 2    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul-624401

**I - Course Name: 23PIT02 - App Development**

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, and AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|   |                                                                                                                                                  |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To provide a foundational understanding of web and mobile application development concepts, including industry trends and emerging technologies. |
| 2 | To enable students to design and develop user-centric applications using modern frontend frameworks and UI/UX principles.                        |
| 3 | To introduce backend development techniques, secure coding practices, and API integration for robust and dynamic applications.                   |
| 4 | To incorporate cloud computing, AI, and machine learning tools into application development for scalability and performance.                     |
| 5 | To develop students' skills in app testing, debugging, and end-to-end project execution through practical, industry-aligned exercises.           |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                |                                                         |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|------------------|
| <b>Preamble:</b><br>This course provides an in-depth understanding of web and mobile application development, covering both frontend and backend technologies alongside industry-relevant tools and frameworks. Students will learn to design responsive user interfaces, develop secure and scalable applications, and integrate cloud-based services and AI functionalities. |                                                         |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                | <b>INTRODUCTION TO APP DEVELOPMENT</b>                  | <b>6 Periods</b> |
| Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App Native vs hybrid vs web apps App development lifecycle-Industry trends and emerging technologies.                                                                                                                                                                                 |                                                         |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                               | <b>FRONTEND DEVELOPMENT &amp; UI/UX DESIGN</b>          | <b>6 Periods</b> |
| HTML, CSS, JavaScript basics-React Native & Flutter framework for app development-UI/UX principles: usability, accessibility, responsive design-Wireframing and prototyping.                                                                                                                                                                                                   |                                                         |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                              | <b>BACKEND DEVELOPMENT &amp; SECURITY</b>               | <b>6 Periods</b> |
| Server-side programming (Node.js, Python) Database systems: MySQL, Firebase API development and integration-Secure coding practices, authentication techniques (OAuth, JWT), encryption.                                                                                                                                                                                       |                                                         |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                               | <b>CLOUD COMPUTING &amp; AI IN APP DEVELOPMENT</b>      | <b>6 Periods</b> |
| Cloud-based deployment and scalability- AI and Machine Learning integration in apps-Data analytics and recommendations systems-Performance optimization and debugging.                                                                                                                                                                                                         |                                                         |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                | <b>APP TESTING, DEBUGGING &amp; PROJECT DEVELOPMENT</b> | <b>6 Periods</b> |
| Testing methodologies (Unit, Integration, Functional)-Debugging techniques and tools Industry best practices for deployment- Capstone Project – End-to-end application development.                                                                                                                                                                                            |                                                         |                  |

**Total: 30 Periods**

**PRACTICAL EXERCISES:**

1. Create a BMI Calculator using React Native
2. Build an Expense Manager App
3. Develop a Unit Conversion App
4. Design a To-Do App
5. Design a User Login Screen using Apache Cordova
6. Build a GPS-based Location Finder using Apache Cordova
7. Create an Android Library App using Java and SQLite  
Extend Library App to include Book Lending and Reservation
8. Consume a REST API and Display Fetched Data
9. Capstone Project: Design and Deploy a Cross-Platform App

**Total:** 30 Periods**Total Periods:** 30+30 =60 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. "Mobile App Development with React Native" by Ethan Holmes & Tom Bray, O'Reilly.<br>2. "Flutter for Beginners" by Alessandro Biessek, Packt Publishing.<br>3. "Node.js, MongoDB, and Angular Web Development" by Brad Dayley, Pearson.                                                                                                             |
| <b>Reference Books:</b>    | 1. "Learning React Native" by Bonnie Eisenman, O'Reilly.<br>2. "Pro Git" by Scott Chacon and Ben Straub (available free at git-scm.com).<br>3. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl.                                                                                                                                  |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.coursera.org/">https://www.coursera.org/</a> (Search: Mobile App Development / Cloud Development / AI Integration)<br><a href="https://www.udemy.com/">https://www.udemy.com/</a> (Courses on Flutter, React Native, Node.js)<br><a href="https://www.edx.org/">https://www.edx.org/</a> (Cloud, Mobile App Development, DevOps) |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                                         | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain and use basic web and mobile technologies like HTML, CSS, JavaScript, and UI/UX principles to create responsive interfaces.     | Understand (K2)      |
| <b>CO2</b>                                                | Describe and build simple cross-platform apps using React Native and Flutter with basic wireframing and prototyping.                    | Understand (K2)      |
| <b>CO3</b>                                                | Implement data-driven applications by connecting server-side code (Node.js/Python) with databases such as MySQL and Firebase.           | Apply (K3)           |
| <b>CO4</b>                                                | Apply secure coding methods, integrate APIs, use authentication (OAuth, JWT), and deploy apps on cloud platforms.                       | Apply (K3)           |
| <b>CO5</b>                                                | Analyze and improve app performance using testing and debugging tools, and create a complete Capstone Project using industry practices. | Analyze (K4)         |



## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | 3   | 2   | 2   | 1   | -   | 2   | 2    | 1    | 1    | 3    | 3    | 1    |
| CO2         | 3   | 3   | 3   | 3   | 2   | 2   | 2   | -   | 2   | 3    | 2    | 1    | 3    | 3    | 1    |
| CO3         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | -   | 2   | 3    | 2    | 1    | 3    | 3    | 1    |
| CO4         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | -   | 2   | 3    | 2    | 2    | 3    | 3    | 1    |
| CO5         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | -   | 3   | 3    | 2    | 2    | 3    | 3    | 1    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PIT03 - Cloud Services Management**

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, and AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|   |                                                                                                                   |
|---|-------------------------------------------------------------------------------------------------------------------|
| 1 | Introduce Cloud Service Management terminology, definition & concepts                                             |
| 2 | Compare and contrast cloud service management with traditional IT service management                              |
| 3 | Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services                |
| 4 | Select appropriate structures for designing, deploying and running cloud-based services in a business environment |
| 5 | Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems               |

**III - Course Content**

**Preamble:** This course provides a comprehensive overview of cloud service management principles, strategies, and operations. It covers cloud service models, architecture, governance, and financial aspects like FinOps and TCO. Learners will gain insights into designing, deploying, and managing secure and scalable cloud services across hybrid and multi-cloud environments.

|                                                                                                                                                                                                                                                                                                            |                                                    |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                            | <b>CLOUD SERVICE MANAGEMENT FUNDAMENTALS</b>       | <b>6 Periods</b> |
| Cloud Ecosystem & Stakeholders, Evolution ITSM to Cloud SM, Cloud-native vs Traditional, Cloud Service Management, Service Perspectives, Cloud Service Models (IaaS, PaaS, SaaS), Multi-cloud & Hybrid Models, Cloud Automation.                                                                           |                                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                           | <b>CLOUD SERVICES STRATEGY</b>                     | <b>6 Periods</b> |
| Cloud Strategy Lifecycle, Cloud Strategy Management Framework, Adoption Frameworks (AWS CAF, Azure CAF, Google CCAI), Key Drivers, Risk Mitigation, Cloud Architecture: Microservices, Containers, Kubernetes; Change Management, Governance as Code                                                       |                                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                          | <b>CLOUD SERVICE DESIGN &amp; OPERATIONS</b>       | <b>6 Periods</b> |
| Basics of Cloud Service Design, Cloud Service Reference Model, Cloud service lifecycle, SLAs & SLOs, Design Patterns, service operations, Legacy Modernization, benchmarking, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management                               |                                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                           | <b>CLOUD SERVICE ECONOMICS</b>                     | <b>6 Periods</b> |
| Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, economics of cloud, Capex vs Opex Shift, FinOps practices, sustainability aspects                                                                                                             |                                                    |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                            | <b>CLOUD GOVERNANCE, SECURITY &amp; COMPLIANCE</b> | <b>6 Periods</b> |
| IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Governance Models & Maturity, Security (Zero Trust, IAM), Compliance (GDPR, HIPAA), Shared Responsibility, Risk Management, Value Measurement, Ethics & Sustainability, Measuring the value of Cloud Services, Balanced |                                                    |                  |

Scorecard, Total Cost of Ownership

Total: 30 Periods

**PRACTICAL EXERCISES:**

1. Create and manage a Cloud Organization using AWS/GCP/Azure/OpenStack.
2. Configure IAM roles, policies, and permission boundaries for secure access.
3. Set up monitoring dashboards (Grafana) and alerts using cloud-native tools.
4. Create a Cost-model for a web application using various services and do Cost-benefit analysis
5. Compare multi-cloud pricing for a web-based application using cost calculators.
6. Create Billing alerts for your Cloud Organization
7. Compare Cloud cost for a simple web application across AWS, Azure and GCP and suggest the best one

Total: 30 Periods

Total Periods: 30+30 =60 Periods

|                            |                                                                                                                                                                                                                                        |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Mehul Mahrishi Kamal Kant Hiran, Ruchi Doshi, Dr. Fagbola Temitayo, "Cloud Computing", BPB Publications, First Edition, 2019.<br>2. Shailendra Singh, "Cloud Computing", Oxford University Press, First edition, 2018.              |
| <b>Reference Books:</b>    | 1. Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing<br>2. Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selv                     |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc21_cs14/">https://onlinecourses.nptel.ac.in/noc21_cs14/</a><br><a href="https://aws.amazon.com/architecture/well-architected/">https://aws.amazon.com/architecture/well-architected/</a> |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the cloud ecosystem, stakeholders, service models, and cloud automation concepts.                                 | Understand (K2)      |
| <b>CO2</b>                                                | Describe cloud strategy lifecycle, adoption frameworks, and cloud-native architectures like microservices and Kubernetes. | Understand (K2)      |
| <b>CO3</b>                                                | Design and manage cloud services including lifecycle, SLAs, legacy modernization, and cloud migration.                    | Apply (K3)           |
| <b>CO4</b>                                                | Analyze cloud pricing models, economic impacts and sustainability considerations.                                         | Analyze (K4)         |
| <b>CO5</b>                                                | Analyze cloud governance frameworks, security models, compliance standards, risk management, and ethical aspects.         | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 2   | 1   | 1   | 2   | 2   | 1   | 2   | 2    | 2    | 1    | 3    | 2    | 2    |
| CO2         | 2   | 3   | 3   | 2   | 2   | 2   | 2   | 1   | 2   | 2    | 3    | 2    | 3    | 3    | 3    |
| CO3         | 3   | 3   | 3   | 2   | 3   | 2   | 2   | 2   | 3   | 3    | 3    | 3    | 3    | 3    | 3    |
| CO4         | 2   | 2   | 2   | 3   | 2   | 3   | 3   | 3   | 2   | 3    | 2    | 2    | 2    | 2    | 2    |
| CO5         | 2   | 2   | 2   | 2   | 2   | 3   | 3   | 3   | 2   | 3    | 2    | 3    | 2    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PIT04 - UI AND UX DESIGN

| Prerequisites | Program Name                               | Sem | Category | L | T | P | C |
|---------------|--------------------------------------------|-----|----------|---|---|---|---|
| Nil           | B.E/B.Tech. – Common to CSE, IT, and AI&DS | V   | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                                     |
|---|-------------------------------------------------------------------------------------|
| 1 | To introduce the principles, differences, and current trends in UI and UX design.   |
| 2 | To develop understanding of visual design, interaction principles, and UI patterns. |
| 3 | To explore UX processes, research methods, and user-centered design approaches.     |
| 4 | To build skills in creating and testing wireframes, prototypes, and mockups.        |
| 5 | To apply ideation techniques, information architecture, and advanced UX practices.  |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                      |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------|
| <b>Preamble:</b> This course offers a comprehensive journey into modern UI/UX design, starting with foundational principles, the interaction between UI and UX, and current industry trends. Students can learn core design concepts—visual hierarchy, typography, interaction patterns—and user centered methodologies grounded in research and empathy. Hands on practice in sketching, wireframing, prototyping, and usability testing will solidify your skills in real-world scenarios. |                                                                      |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>FOUNDATIONS OF UI/UX DESIGN &amp; CURRENT TRENDS</b>              | <b>6 Periods</b> |
| UI Vs UX Design - Understanding the difference and the synergy - Importance of User-Centered Design Principles - Core Stages of Design Thinking - Divergent and Convergent Thinking - Emerging industry trends (AI in UX, dark mode, minimalism, etc.) – Six Hat Design Principles.                                                                                                                                                                                                          |                                                                      |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>UI DESIGN PRINCIPLES</b>                                          | <b>6 Periods</b> |
| Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Style Guides - Typography and color theory, Visual identity and branding.                                                                                                                                                                                                                                                                                                                       |                                                                      |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>UX DESIGN PRINCIPLES</b>                                          | <b>6 Periods</b> |
| Introduction to User Experience - Understanding User Experience - Analysing user data to identify key insights and pain points - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business                                                                                                                                                                               |                                                                      |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>WIREFRAMING, PROTOTYPING AND TESTING</b>                          | <b>6 Periods</b> |
| Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High- Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration.                                                                                                                                              |                                                                      |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>RESEARCH, DESIGNING, IDEATING, &amp; INFORMATION ARCHITECTURE</b> | <b>6 Periods</b> |
| Identifying and Writing Problem Statements- Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios-Flow Diagrams - Flow Mapping - Information Architecture Advanced Topics - AI in UX - Persuasive UX - Cultural and Legal Issues in UX - Measuring ROI from UX                                                                                                                                                       |                                                                      |                  |

Total: 30 Periods



**PRACTICAL EXERCISES:**

1. Study of various UI/UX open source tools.
2. Tool Setup & UI Screen Creation (e.g., login page)
3. Create User Persona & Empathy Map
4. Design Low-Fidelity Wireframes (mobile app/web app)
5. Build an Interactive Prototype for any societal application (Mood board, Fonts, Colors based on UI principles).
6. Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping.
7. Create a project for portfolio development.

**Note: The lab instructor is expected to design Problems based on the topics listed.**

**The Examination shall not be restricted to the sample experiments designed.**

**Total: 30 Periods**

**Total Periods: 30+30 =60 Periods**

|                            |                                                                                                                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b>    | 1. Joel Marsh, "UX for Beginners", O'Reilly , 2022<br>2. Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services" O'Reilly 2021<br>3.                                                                                                                   |
|                            | 3. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface" 3 rd Edition , O'Reilly 2020<br>4. Steve Schoger, Adam Wathan "Refactoring UI", 2018.<br>5. Steve Krug, "Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile", Third Edition, 2015 |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.nngroup.com/articles/">https://www.nngroup.com/articles/</a><br><a href="https://www.interaction-design.org/literature">https://www.interaction-design.org/literature</a>                                                                                  |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain UI and UX foundations, differences, and trends.                            | Understand (K2)      |
| <b>CO2</b>                                                | Apply visual design and interaction principles in UI development.                  | Apply (K3)           |
| <b>CO3</b>                                                | Apply UX processes and research to address user and business needs.                | Apply (K3)           |
| <b>CO4</b>                                                | Design wireframes, prototypes, and mockups.                                        | Apply (K3)           |
| <b>CO5</b>                                                | Implement ideation techniques, information architecture, and advanced UX concepts. | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 1   | 2   | 3   | -   | -   | -   | -   | 1   | 1    | 3    | 1    | 3    | 2    | 1    |
| CO2         | 3   | 2   | 1   | 2   | 2   | -   | -   | -   | 2   | 2    | 2    | 1    | 3    | 2    | 3    |
| CO3         | 2   | 2   | 3   | 2   | 1   | -   | -   | -   | 3   | 3    | 1    | 2    | 1    | 1    | 3    |
| CO4         | 1   | 3   | 1   | 3   | 1   | -   | -   | -   | 1   | 2    | 1    | 1    | 1    | 3    | 1    |
| CO5         | 3   | 3   | 1   | 1   | 2   | -   | -   | -   | 2   | 2    | 2    | 2    | 2    | 2    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PIT05 - Software Testing and Automation**

| Prerequisite                                                                                                     | Program Name                                     | Sem      | Category | L | T | P | C |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------|----------|---|---|---|---|
| 23IT401 - Object Oriented Software Modelling and Development /<br>23CS403 - Object Oriented Software Engineering | B.E/B.Tech. –<br>Common to CSE, IT,<br>and AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|   |                                                                                  |
|---|----------------------------------------------------------------------------------|
| 1 | To understand the basics of software testing                                     |
| 2 | To learn how to do the testing and planning effectively                          |
| 3 | To build test cases and execute them                                             |
| 4 | To focus on wide aspects of testing and understanding multiple facets of testing |
| 5 | To get an insight about test automation and the tools used for test automation   |

**III - Course Content****Preamble:**

This course provides a strong foundation in software testing principles and practices, covering both manual and automated testing. The course emphasizes practical skills for ensuring software quality through real-world tools and industry practices.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                        |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>FOUNDATIONS OF SOFTWARE TESTING</b> | <b>6 Periods</b> |
| Purpose and objectives of testing, Software Development Life Cycle, Black box and White box testing, Software Testing Life Cycle, V Model of Software testing, failures, errors, faults(defects), Software testing principle, Stages of testing: Unit, Integration, System, Acceptance testing.                                                                                                                                                                                  |                                        |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>TEST PLANNING AND MANAGEMENT</b>    | <b>6 Periods</b> |
| Test planning: Goals, Strategy, Scope, High level expectations, inter group responsibilities, Resource Requirements, Test Strategy, Test phase, Test Schedule, Test cases, Tester Assignments, Metrics and Statistics.                                                                                                                                                                                                                                                           |                                        |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>TEST DESIGN AND EXECUTION</b>       | <b>6 Periods</b> |
| Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model- Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle. Combinatorial Testing, (PICT and ACTS model) |                                        |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>ADVANCED TESTING CONCEPTS</b>       | <b>6 Periods</b> |
| Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.                                                                                                                                                                                     |                                        |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

| Unit – V                                                                                                                                                                                                                                               | TEST AUTOMATION AND TOOLS | 6 Periods |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------|
| Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events. Introduction to Cucumber. |                           |           |

Total: 30 Periods

**PRACTICAL EXERCISES:**

1. Develop the test plan for testing an e-commerce web/mobile application(www.amazon.in).
2. Design the test cases for testing the e-commerce application
3. Test the e-commerce application and report the defects in it.
4. Develop the test plan and design the test cases for an inventory control system.
5. Execute the test cases against a client server or desktop application and identify the defects.
6. Performance Testing of Web Application
7. Automate the testing of e-commerce applications using Selenium.
8. Integrate TestNG with the above test automation.
9. Mini project
  - a) Build a data-driven framework using Selenium and TestNG
  - b) Build Page object Model using Selenium and TestNG
  - c) Build a hybrid Automation framework

Total: 30 Periods

Total Periods: 30+30 =60 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Yogesh Singh, "Software Testing", Cambridge University Press, 2012.<br>2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" – Second Edition 2018.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Reference Books:</b>    | 11. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.<br>2. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth Edition, 2014, Taylor & Francis Group<br>3. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packet Publishing.<br>4. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.<br>5. Satya Avasarala, Selenium WebDriver Practical Guide, 2014, Packet Publishing.<br>6. Varun Menon, TestNG Beginner's Guide, 2013, Packet Publishing. |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.techtarget.com">https://www.techtarget.com</a><br><a href="https://developer.mozilla.org/">https://developer.mozilla.org/</a><br><a href="https://html.spec.whatwg.org/">https://html.spec.whatwg.org/</a><br><a href="https://css-tricks.com/">https://css-tricks.com/</a><br>Coursera, edX, NPTEL / SWAYAM (India), Udemy                                                                                                                                                                                                                                                                                                                                                 |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Describe fundamental concepts, principles, and lifecycle models of software testing.                                           | Understand (K2)      |
| CO2                                                       | Plan and document test strategies, test plans, and test cases for various software systems using industry-standard techniques. | Apply (K3)           |
| CO3                                                       | Design and execute effective test cases using black-box and white-box testing techniques and report the test results.          | Apply (K3)           |
| CO4                                                       | Analyze the defects using manual testing processes and interpret performance metrics using tools like JMeter.                  | Analyze (K4)         |
| CO5                                                       | Analyze the automated test scripts using Selenium WebDriver and TestNG to validate software functionality.                     | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 2   | 3   | 2   | 1   | 1   | 1   | -   | 2    | 2    | 1    | 3    | 2    | 1    |
| CO2         | 3   | 3   | 3   | 3   | 2   | 2   | 2   | 2   | -   | 2    | 3    | 2    | 3    | 3    | 1    |
| CO3         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 2   | -   | 2    | 3    | 2    | 3    | 3    | 1    |
| CO4         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 2   | -   | 2    | 3    | 2    | 3    | 3    | 1    |
| CO5         | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 2   | -   | 3    | 3    | 2    | 3    | 3    | 1    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23PIT06 - Web Application Security**

| Prerequisite | Program Name                      | Sem      | Category | L | T | P | C |
|--------------|-----------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, & IT | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|   |                                                               |
|---|---------------------------------------------------------------|
| 1 | To understand web app security fundamentals and architecture. |
| 2 | To Apply secure development lifecycle and standards.          |
| 3 | To Secure APIs and subdomains against threats.                |
| 4 | To perform vulnerability assessment and penetration testing.  |
| 5 | To identify and prevent common web attacks using tools.       |

**III - Course Content**

**Preamble:** This course introduces the fundamentals of web application security and secure software development. It covers common vulnerabilities, security standards, and best practices for building secure applications. Students will learn vulnerability assessment, penetration testing, and prevention of common attacks. The course also provides hands-on experience with security tools and techniques used by professionals.

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                               | WEB APPLICATION ARCHITECTURE AND SECURITY FUNDAMENTALS | 6 Periods |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------|
| History and Evolution of Software Security -Web Application Architecture: Modern vs Legacy-Structure of Modern Web Applications: REST APIs, JSON, Browser DOM, SPA Frameworks-Authentication and Authorization Systems-Secure Socket Layer (SSL) and Transport Layer Security (TLS)-Session Management and Input Validation-Web Servers, Server-Side Databases, Client-Side Data Stores                                                                |                                                        |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                              | SECURE DEVELOPMENT LIFECYCLE & STANDARDS               | 6 Periods |
| Web Application Security Principles-Security Testing and Vulnerability Management-Security Incident Response Planning-Microsoft Security Development Lifecycle (SDL)-OWASP CLASP (Comprehensive Lightweight Application Security Process)-Software Assurance Maturity Model (SAMM)-Defensive Software Architecture-Secure-Coding Anti-Patterns-Security Automation: Static and Dynamic Analysis                                                        |                                                        |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                             | SUBDOMAIN, API SECURITY & INFORMATION EXPOSURE         | 6 Periods |
| Multiple Applications per Domain-Subdomain Enumeration (Brute Forcing & Dictionary Attacks)-Zone Transfer Attacks-Browser's Built-In Network Analysis Tools-Search Engine Caches, Accidental Archives, and Social Snapshots-API Security: Endpoint Discovery & Shapes, Authentication Mechanisms-Token-Based Authentication, API Keys, OAuth2-Securing Microservice APIs and Service-to-Service Communication-Rate Limiting, Encryption, Audit Logging |                                                        |           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                | VULNERABILITY ASSESSMENT AND EXPLOITATION             | 6 Periods |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------|
| Vulnerability Assessment Lifecycle-Vulnerability Assessment Tools: Host-based, Network-based, Cloud, and DB Scanners-Penetration Testing: External, Internal, Web App, Mobile, and Wireless Testing-Detecting Client-Side and Server-Side Frameworks-Secure vs Insecure Architecture Indicators-Common Vulnerabilities and Exposures (CVE) Database-Bug Bounty Programs and Vulnerability Regression Testing                             |                                                       |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                 | COMMON ATTACKS, HACKING TECHNIQUES & PREVENTION TOOLS | 6 Periods |
| Cross-Site Scripting (XSS): Stored, Reflected, DOM-based, Mutation-based-Cross-Site Request Forgery (CSRF) and POST Manipulation-SQL Injection, Code Injection, Command Injection-XML External Entity (XXE) Attacks-Denial of Service (DoS): ReDoS, Logical DoS, Distributed DoS-Social Engineering Attacks-Insecure Cryptographic Storage and Security Misconfigurations-Prevention Tools: Open VAS, Comodo, Nexpose, Nikto, Burp Suite |                                                       |           |

Total: 30 Periods

**PRACTICAL EXERCISES:**

1. Install Wireshark and explore various protocols
  - a. Analyze the difference between HTTP and HTTPS
  - b. Analyze security mechanisms in different protocols
2. Identify vulnerabilities using OWASP ZAP tool
3. Create a simple REST API using Python for the following operations:
  - a. GET
  - b. PUSH
  - c. POST
  - d. DELETE
4. Install Burp Suite and perform the following attacks
  - a. SQL Injection
  - b. Cross-Site Scripting (XSS)
5. Simulate a website attack using Social Engineering techniques.

Total: 30 Periods

Total Periods: 30+30 =60 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Andrew Hoffman, Web Application Security- Exploitation and Countermeasures for Modern Web Applications, March 2020, 1st Edition, O'Reilly Media, California.</li> <li>2. Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, The McGraw Hill Companies.</li> <li>3. Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.</li> </ol>                                                                                                                      |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing, Inc.</li> <li>2. Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor &amp; Francis Group, LLC.</li> <li>3. Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA.</li> <li>4. Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc. Handbook of Research on Blockchain Technology- published by Elsevier Inc. ISBN: 9780128198162- 2020.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://owasp.org/">https://owasp.org/</a><br><a href="https://developers.google.com/web/fundamentals">https://developers.google.com/web/fundamentals</a><br><a href="https://codepen.io/">https://codepen.io/</a>                                                                                                                                                                                                                                                                                                                             |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                          | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understanding the basic concepts of web application security and the need for it.        | Understand (K2)      |
| CO2                                                       | Describe the process for secure development and deployment of web applications.          | Understand (K2)      |
| CO3                                                       | Acquire the skill to design and develop secure web applications that use secure APIs.    | Apply (K3)           |
| CO4                                                       | Analyze the importance of carrying out vulnerability assessment and penetration testing. | Analyze (K4)         |
| CO5                                                       | Analyze the skill to think like a hacker and to use hacker toolsets.                     | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 2   | 2   | 3   | -   | -   | -   | -   | -    | 1    | -    | 3    | 2    | 1    |
| CO2         | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -   | -    | 2    | -    | 3    | 2    | 1    |
| CO3         | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -   | -    | 2    | -    | 3    | 2    | 1    |
| CO4         | 3   | 3   | 3   | 3   | 3   | -   | -   | -   | -   | -    | 2    | -    | 3    | 2    | 1    |
| CO5         | 3   | 3   | 3   | 3   | 3   | -   | -   | -   | -   | -    | 1    | -    | 3    | 2    | 1    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PIT07 - DevOps

| Prerequisite      | Program Name                               | Sem      | Category | L | T | P | C |
|-------------------|--------------------------------------------|----------|----------|---|---|---|---|
| Operating Systems | B.E/B.Tech. – Common to CSE, IT, and AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                                                         |
|---|---------------------------------------------------------------------------------------------------------|
| 1 | To introduce DevOps terminology, definition & concepts                                                  |
| 2 | To understand the different Version control tools like Git, Mercurial                                   |
| 3 | To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment)        |
| 4 | To understand Configuration management using Ansible                                                    |
| 5 | Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems |

## III - Course Content

**Preamble:** This course introduces the core concepts of DevOps practices to streamline software development and operations. It covers version control, continuous integration, continuous deployment, and configuration management. Students will gain hands-on experience with tools like Git, Jenkins, Maven, Ansible, and Azure DevOps. The course emphasizes automation, collaboration, and best practices for faster and more reliable software delivery.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                   |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>INTRODUCTION TO DEVOPS</b>                     | <b>6 Periods</b> |
| Devops Essentials - Introduction to AWS, GCP, Azure-Version control systems: Git and Github. DevOps Lifecycle and Automation Tools Overview Infrastructure as Code (IaC) Fundamentals                                                                                                                                                                                                                                                                                                                                                                  |                                                   |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>COMPILE AND BUILD USING MAVEN &amp; GRADLE</b> | <b>6 Periods</b> |
| Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases (compile build, test, package) Maven Profiles, Maven repositories (local, central, global), Maven plugins, Maven create and build Artifacts, Dependency management, Installation of Gradle, understand build using Gradle, Build Optimization Techniques and Best Practices - Integrating Static Code Analysis Tools (e.g., SonarQube) in Build Process                                                                                                            |                                                   |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>CONTINUOUS INTEGRATION USING JENKINS</b>       | <b>6 Periods</b> |
| Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace, Kubernetes – Cluster Architecture. Jenkins Pipelines using Groovy (Scripted and Declarative Pipelines) - Integration with Docker and Containerized Builds |                                                   |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>CONFIGURATION MANAGEMENT USING ANSIBLE</b>     | <b>6 Periods</b> |
| Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible, Integration of Ansible with Jenkins and CI/CD Pipelines - Ansible Vault for Securing Sensitive Information                                                                                                                                                                                                                                                 |                                                   |                  |



| Unit – V                                                                                                                                                                                                                                                                                       | BUILDING DEVOPS PIPELINES USING AZURE | 6 Periods |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------|
| Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure pipelines. yaml file, Azure DevOps with Docker and Kubernetes Integration Monitoring and Feedback Loop Integration using Azure Monitor and Application Insights. |                                       |           |

Total: 30 Periods

**PRACTICAL EXERCISES:**

1. Create Maven Build pipeline in Azure
2. Run regression tests using Maven Build pipeline in Azure
3. Install Jenkins in Cloud
4. Create CI pipeline using Jenkins
5. Create a CD pipeline in Jenkins and deploy in Cloud
6. Create an Ansible playbook for a simple web application infrastructure
7. Build a simple application using Gradle
8. Install Ansible and configure ansible roles and to write playbooks

Total: 30 Periods

Total Periods: 30+30 =60 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.<br>2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014                                                                                                                                                                                                                                                                                                                                                                |
| <b>Reference Books:</b>    | 1. Hands-On Azure DevOps: Cidc Implementation for Mobile, Hybrid, And Web Applications Using Azure Devops and Microsoft Azure: CICD Implementation for DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni<br>2. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.<br>3. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016.<br>4. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019. |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.jenkins.io/user-handbook.pdf">https://www.jenkins.io/user-handbook.pdf</a><br><a href="https://maven.apache.org/guides/getting-started/">https://maven.apache.org/guides/getting-started/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

  
 Chairperson, Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                                   | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand different actions performed through Version control tools like Git.                                                                                    | Understand (K2)      |
| CO2                                                       | Describe how Continuous Integration, Continuous Testing, and Continuous Deployment are done using Jenkins with automated test cases built using Maven and Gradle. | Understand (K2)      |
| CO3                                                       | Apply automated Continuous Deployment techniques in a DevOps environment.                                                                                         | Apply (K3)           |
| CO4                                                       | Apply configuration management practices using Ansible.                                                                                                           | Apply (K3)           |
| CO5                                                       | Analyze and use cloud-based DevOps tools by leveraging Azure DevOps for end-to-end workflows.                                                                     | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 2   | 1   | 2   | 2   | -   | -   | -   | -   | 1    | 1    | 1    | 2    | 2    | 2    |
| CO2         | 2   | 1   | -   | 1   | 1   | -   | -   | -   | -   | 2    | 1    | 1    | 2    | 3    | 1    |
| CO3         | 2   | 2   | 1   | 2   | 2   | 1   | 1   | 1   | -   | 1    | 2    | 1    | 2    | 2    | 3    |
| CO4         | 3   | 2   | 2   | 1   | 2   | -   | -   | -   | -   | 1    | 1    | 2    | 3    | 3    | 2    |
| CO5         | 2   | 2   | 1   | 2   | 2   | -   | -   | -   | -   | 1    | 1    | 1    | 2    | 2    | 2    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PIT08 - Principles of Programming Languages

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, and AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                                                                               |
|---|-------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand the syntax and semantics of various programming languages.                                                      |
| 2 | To analyze the principles of data types, variable binding, and scope management.                                              |
| 3 | To evaluate control structures and exception handling mechanisms in programming languages.                                    |
| 4 | To explore subprogram structures, parameter passing techniques, and their implementations.                                    |
| 5 | To gain insight into diverse programming paradigms, including object-oriented, functional, concurrent, and logic programming. |

## III - Course Content

**Preamble:** This course introduces the fundamental concepts of programming languages, focusing on the principles of syntax, semantics, data types, control structures, subprograms, and modern programming paradigms. It enables students to understand the design and implementation of various language constructs and enhances their ability to analyze and evaluate different language features.

|                                                                                                                                                                                                        |                                                    |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                        | <b>SYNTAX AND SEMANTICS</b>                        | <b>6 Periods</b> |
| Syntax and Semantics: Evolution of programming languages, context-free grammars, attribute grammars, lexical analysis, parsing techniques, abstract syntax trees.                                      |                                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                       | <b>DATA, DATA TYPES, AND BASIC STATEMENTS</b>      | <b>6 Periods</b> |
| Data Types and Variables: Names, variables, binding, type checking, scope rules, lifetime, garbage collection, primitive data types, arrays, records, environments, declarations.                      |                                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                      | <b>EXPRESSIONS AND STRUCTURES</b>                  | <b>6 Periods</b> |
| Expressions and Control Structures: Arithmetic and Boolean expressions, control structures, selection and iteration constructs, exception handling, commands (imperative style), recursion constructs. |                                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                       | <b>SUBPROGRAMS AND IMPLEMENTATIONS</b>             | <b>6 Periods</b> |
| Subprograms and Implementations: Subprograms, parameter passing, stack and heap management, nested subprograms, closures, first-class functions.                                                       |                                                    |                  |
| <b>Unit – V</b>                                                                                                                                                                                        | <b>OBJECT-ORIENTATION IN PROGRAMMING LANGUAGES</b> | <b>6 Periods</b> |
| Programming Paradigms: Object-oriented programming, functional programming, logic programming, concurrent programming, parallel constructs.                                                            |                                                    |                  |

Total: 30 Periods

Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

**PRACTICAL EXERCISES:**

1. Parsing and Abstract Syntax Trees
2. Lexical Analysis Mini-Scanner
3. Data Types and Binding Demonstration
4. Control Structures and Exception Handling
5. Recursion vs Iteration Efficiency
6. Subprograms, Closures, and Parameter Passing
7. Programming Paradigms Exploration.

**Total:** 30 Periods**Total Periods:** 30+30 =60 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1.Tucker, A. B., & Noonan, R. E. (2021). <i>Programming languages: Principles and paradigms</i> . McGraw-Hill Education.<br>2.Sebesta, R. W. (2021). <i>Concepts of programming languages</i> (12th ed.). Pearson.                                                                                                                                                                                                                                                                                                    |
| <b>Reference Books:</b>    | 1.Pierce, B. C. (2020). <i>Types and programming languages</i> . MIT Press.<br>2.Scott, M. L. (2022). <i>Programming language pragmatics</i> (5th ed.). Morgan Kaufmann.<br>3.Friedman, D. P., Wand, M., & Haynes, C. T. (2020). <i>Essentials of programming languages</i> (3rd ed.). MIT Press.<br>4.Bansal, A. K. (2021). <i>Introduction to programming languages</i> . CRC Press.<br>5.Appel, A. W., & Palsberg, J. (2022). <i>Modern compiler implementation in Java</i> (2nd ed.). Cambridge University Press. |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.geeksforgeeks.org/introduction-to-programming-languages/">https://www.geeksforgeeks.org/introduction-to-programming-languages/</a><br><a href="https://www.tutorialspoint.com/principles_of_programming_languages/index.htm">https://www.tutorialspoint.com/principles_of_programming_languages/index.htm</a><br><a href="https://www.cse.iitk.ac.in/users/pproy/pl/">https://www.cse.iitk.ac.in/users/pproy/pl/</a>                                                                             |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                          | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the syntax and semantics used in programming languages.                       | Understand (K2)      |
| <b>CO2</b>                                                | Understand different data types and how variables are bound in programming.              | Understand (K2)      |
| <b>CO3</b>                                                | Apply control structures and exception-handling techniques in programs.                  | Apply (K3)           |
| <b>CO4</b>                                                | Apply the concepts of subprograms and their implementations in programming.              | Apply (K3)           |
| <b>CO5</b>                                                | Analyze various programming paradigms, including concurrency and functional abstraction. | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 3   | 2   | -   | 1   | 1   | 1   | -   | -    | 2    | 2    | 3    | 2    | 1    |
| CO2         | 3   | 3   | 3   | 2   | -   | -   | -   | 1   | -   | -    | 2    | -    | 3    | 2    | 1    |
| CO3         | 3   | 3   | 3   | 3   | 2   | 1   | 1   | 2   | -   | -    | 2    | 2    | 3    | 2    | 1    |
| CO4         | 3   | 2   | 3   | 2   | 2   | -   | -   | 1   | -   | -    | 1    | 1    | 3    | 2    | 1    |
| CO5         | 3   | 3   | 3   | 3   | 3   | 1   | 1   | 1   | -   | -    | -    | -    | 3    | 2    | 1    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PCS01 - Virtualization

| Prerequisite | Program Name                           | Sem      | Category | L | T | P | C |
|--------------|----------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                        |
|---|------------------------------------------------------------------------|
| 1 | Understand the basics and importance of virtualization.                |
| 2 | Learn different types of virtualization and their applications.        |
| 3 | Gain practical knowledge of virtual machine and hypervisor management. |
| 4 | Explore storage, network, desktop, and server virtualization.          |
| 5 | Understand virtualization security, automation, and current trends.    |

## III - Course Content

**Preamble:** This course introduces the foundational concepts and practical applications of virtualization in modern IT environments. It covers types of virtualization across hardware, servers, storage, and networks, emphasizing resource optimization and scalability. Learners will gain hands-on understanding of virtual machine management, hypervisors, and emerging trends in virtualization and cloud computing.

|                                                                                                                                                                                                                                                                                                             |                                                          |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                             | <b>INTRODUCTION</b>                                      | <b>6 Periods</b> |
| Cloud Computing - Virtualization and cloud computing - Benefits and Need for Virtualization - Types : Hardware, Server, Desktop, Network, Storage - Limitations and Challenges - Overview of Virtualized IT Infrastructure                                                                                  |                                                          |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                            | <b>VIRTUAL MACHINE BASICS AND DESKTOP VIRTUALIZATION</b> | <b>6 Periods</b> |
| Virtual Machine Basics and Lifecycle - Introduction to Hypervisors: Type 1 and Type 2- Role of Hypervisor and Virtual Machine Monitor (VMM) - VM Provisioning, Migration, and Scaling Basics - Desktop Virtualization -Types of Desktop Virtualization                                                      |                                                          |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                           | <b>HARDWARE AND SERVER VIRTUALIZATION</b>                | <b>6 Periods</b> |
| Hardware Virtualization: Full, Para, and OS-level Virtualization - CPU, Memory, and Storage Virtualization Concepts - Server virtualization fundamentals and platforms (VMware ESXi, Hyper-V) - Creating and managing virtual desktops and servers- Server consolidation, resource allocation, and security |                                                          |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                            | <b>STORAGE AND NETWORK VIRTUALIZATION</b>                | <b>6 Periods</b> |
| Introduction to Network Virtualization: VLANs, Virtual Switches, and Virtual Networks - Storage Virtualization Basics: SAN, NAS, RAID - Managing Virtual Machines and Storage - Virtualization Management Tools                                                                                             |                                                          |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                             | <b>SECURITY, AUTOMATION, AND TRENDS</b>                  | <b>6 Periods</b> |
| Security in Virtualization: Risks and Best Practices - Basics of Automation and Backup in Virtual Environments - Recent Trends and Future Directions in Virtualization - Case Study                                                                                                                         |                                                          |                  |

Total: 30 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**PRACTICAL EXERCISES:**

1. Create a Virtual Machine Using VirtualBox or VMware
2. Allocate and Modify Virtual Machine Memory and Storage
3. Create and Manage Snapshots of a Virtual Machine
4. Set Up VLAN Networking Using Cisco Packet Tracer
5. Create Spanned and Mirrored Volumes on a Guest OS
6. Configure Desktop Virtualization Using VNC
7. Create a Nested Virtual Machine (VM Inside a VM)

**Total:** 30 Periods**Total Periods:** 30+30 =60 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Chris Wolf and Erick M. Halter, Virtualization, Apress</li> <li>2. Latifa Boursas (Editor), Mark Carlson (Editor), Wolfgang Hommel (Editor), Michelle Sibilla (Editor), Kes Wold (Editor), Systems and Virtualization Management: Standards and New Technologies</li> <li>3. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-Hill, 2010</li> <li>4. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing (Principles and Paradigms), Wiley, 2011</li> <li>5. Nelson Ruest, Danielle Ruest, Virtualization: A Beginner's Guide, McGraw-Hill, 2009</li> </ol>                                                                                                                                                                                                             |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Massimo Cafaro (Editor), Giovanni Aloisio (Editor), Grids, Clouds and Virtualization, Springer</li> <li>2. Edward L. Haletky, VMware ESX Server in the Enterprise, Prentice Hall</li> <li>3. Gaurav Somani, Scheduling and Isolation in Virtualization, VDM Verlag Dr. Müller, Germany</li> <li>4. Edward Haletky, VMware ESX and ESXi in the Enterprise – Planning Deployment of Virtualization Servers, Prentice Hall</li> <li>5. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach</li> <li>6. William Von Hagen, Professional Xen Virtualization, Wiley, 2008</li> <li>7. Matthew Portney, Virtualization Essentials, Wiley, 2012</li> <li>8. Dave Shackleford, Virtualization Security: Protecting Virtualized Environments, Wiley, 2012</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://labs.hol.vmware.com">https://labs.hol.vmware.com</a><br><a href="https://learn.microsoft.com/en-us/virtualization/hyper-v-on-windows/">https://learn.microsoft.com/en-us/virtualization/hyper-v-on-windows/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

  
**Chairperson-Board of Studies,**  
**Department of Information Technology,**  
**NPR College of Engineering & Technology**  
**(Autonomous),**  
**Natham, Dindigul 624401**

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                          | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain key virtualization concepts and types.                           | Understand (K2)      |
| CO2                                                       | Install and manage virtual machines and hypervisors.                     | Apply (K3)           |
| CO3                                                       | Apply server, desktop, storage, and network virtualization techniques    | Apply (K3)           |
| CO4                                                       | Use management tools to administer virtualized environments.             | Apply (K3)           |
| CO5                                                       | Identify security challenges and implement automation in virtualization. | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 2   | 2   | 2   | -   | -   | -   | 2   | 2    | 3    | 3    | 3    | 2    | 3    |
| CO2         | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | 2   | 2    | 3    | 3    | 3    | 2    | 3    |
| CO3         | 3   | 3   | 3   | 3   | 3   | -   | -   | -   | 2   | 2    | 3    | 3    | 3    | 2    | 3    |
| CO4         | 3   | 2   | 2   | 2   | 3   | -   | -   | -   | 2   | 2    | 3    | 3    | 3    | 2    | 3    |
| CO5         | 3   | 3   | 3   | 2   | 3   | 2   | 2   | -   | 2   | 2    | 3    | 3    | 3    | 2    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PCS02 - Data Warehousing

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, and AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                             |
|---|-------------------------------------------------------------|
| 1 | To know the details of data warehouse Architecture          |
| 2 | To understand the OLAP Technology                           |
| 3 | To understand the partitioning strategy                     |
| 4 | To differentiate various schema                             |
| 5 | To understand the roles of process manager & system manager |

## III - Course Content

**Preamble:** This course provides an in-depth understanding of data warehousing concepts, architecture, and technologies. It explores ETL processes, OLAP operations, metadata management, and dimensional modelling techniques essential for analytical systems. Students will gain practical insights into warehouse design, schema structures, and modern tools through case studies in domains like retail and banking.

|                                                                                                                                                                                                                                                                                                                     |                                                    |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                     | <b>INTRODUCTION TO DATA WAREHOUSE</b>              | <b>6 Periods</b> |
| Data warehouse Introduction - Data warehouse components- operational database Vs data warehouse – Data warehouse Architecture – Three-tier Data Warehouse Architecture - Autonomous Data Warehouse- Autonomous Data Warehouse Vs Snowflake - Modern Data Warehouse                                                  |                                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                    | <b>ETL AND OLAP TECHNOLOGY</b>                     | <b>6 Periods</b> |
| What is ETL – ETL Vs ELT – Types of Data warehouses - Data warehouse Design and Modeling - Delivery Process - Online Analytical Processing (OLAP) - Characteristics of OLAP - Online Transaction Processing (OLTP) Vs OLAP - OLAP operations- Types of OLAP- ROLAP Vs MOLAP Vs HOLAP.                               |                                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                   | <b>META DATA, DATA MART AND PARTITION STRATEGY</b> | <b>6 Periods</b> |
| Meta Data – Categories of Metadata – Role of Metadata – Metadata Repository – Challenges for Meta Management - Data Mart – Need of Data Mart- Cost Effective Data Mart- Designing Data Marts- Cost of Data Marts- Partitioning Strategy – Vertical partition – Normalization – Row Splitting – Horizontal Partition |                                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                    | <b>DIMENSIONAL MODELING AND SCHEMA</b>             | <b>6 Periods</b> |
| Dimensional Modeling - Multi-Dimensional Data Modeling – Data Cube- Star Schema- Snowflake schema- Star Vs Snowflake schema- Fact constellation Schema- Schema Definition - Process Architecture- Types of Data Base Parallelism – Datawarehouse Tools Case Study: Retail Store Sales Analysis                      |                                                    |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                     | <b>SYSTEM &amp; PROCESS MANAGERS</b>               | <b>6 Periods</b> |
| Data Warehousing System Managers: System Configuration Manager- System Scheduling Manager - System Event Manager - System Data Warehousing Process Managers: Load Manager – Warehouse Manager- Query Manager – Tuning – Testing, Data Governance and Security Case Study: Banking Data Warehouse Management         |                                                    |                  |

Total: 30 Periods

**PRACTICAL EXERCISES:**

1. Data exploration and integration with WEKA
2. Apply weka tool for data validation
3. Plan the architecture for real time application
4. Write the query for schema definition
5. Design data ware house for real time applications
6. Analyse the dimensional Modeling
7. Case Study: Sales Analysis for a Global Retail Chain
8. Case Study: Banking Transaction System
9. Implementation of warehouse testing.

**Total: 30 Periods****Total Periods: 30+30 =60 Periods**

|                            |                                                                                                                                                                                                                                                      |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.<br>2. Ralph Kimball, "The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling", Third edition, 2013. |
| <b>Reference Books:</b>    | 1. Paul Raj Ponniah, "Data warehousing fundamentals for IT Professionals", 2012.<br>2. K.P. Soman, ShyamDiwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.                    |
| <b>MOOC/Web Platforms:</b> | <a href="https://cloud.google.com/bigquery/docs/introduction">https://cloud.google.com/bigquery/docs/introduction</a><br><a href="https://aws.amazon.com/redshift/getting-started/">https://aws.amazon.com/redshift/getting-started/</a>             |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the basic concepts, components, and architecture of data warehouses.    | Understand (K2)      |
| <b>CO2</b>                                                | Explain ETL/ELT processes and OLAP technologies used in data analysis.             | Understand (K2)      |
| <b>CO3</b>                                                | Describe metadata, data marts, and partitioning strategies in data warehousing.    | Understand (K2)      |
| <b>CO4</b>                                                | Apply dimensional modeling techniques and design different data warehouse schemas. | Apply (K3)           |
| <b>CO5</b>                                                | Analyze the roles of system and process managers in data warehouse management.     | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -   | 2    | 2    | 3    | -    | 2    | 3    |
| CO2         | 3   | -   | 2   | -   | 3   | -   | -   | -   | -   | -    | -    | 3    | 2    | -    | 3    |
| CO3         | 3   | 3   | -   | 3   | 3   | -   | -   | -   | -   | -    | 2    | 3    | -    | -    | 3    |
| CO4         | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -   | 2    | 2    | 3    | -    | -    | 3    |
| CO5         | -   | -   | 3   | -   | 3   | 2   | 2   | 2   | 2   | 3    | 2    | -    | 3    | 3    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23PCS03 - Storage Technologies**

| Prerequisite | Program Name                           | Sem      | Category | L | T | P | C |
|--------------|----------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                |
|---|--------------------------------------------------------------------------------|
| 1 | Characterize the functionalities of logical and physical components of storage |
| 2 | Describe various storage networking technologies                               |
| 3 | Identify different storage virtualization technologies                         |
| 4 | Discuss the different backup and recovery strategies                           |
| 5 | Understand common storage management activities and solutions                  |

**III - Course Content**

**Preamble:** This course covers the core concepts of modern information storage systems and data center infrastructure. It includes RAID, intelligent storage, SAN/NAS technologies, and data backup and replication. Emphasis is placed on securing storage environments and managing enterprise-scale storage solutions.

|                 |                                         |                  |
|-----------------|-----------------------------------------|------------------|
| <b>Unit – I</b> | <b>INTRODUCTION AND STORAGE SYSTEMS</b> | <b>9 Periods</b> |
|-----------------|-----------------------------------------|------------------|

Introduction to Information Storage- Evolution of Storage Architecture-Data Center Infrastructure-Core Elements, Key Characteristics and Managing a Data Center-Virtualization and Cloud Computing-Information Lifecycle Management-Third Platform Technologies: Characteristics of third platform infrastructure and Imperatives for third platform transformation-Data Center Environment: Application, Compute, Connectivity – Storage-Disk Drive Components-Performance-Direct-Attached Storage

|                  |                                             |                  |
|------------------|---------------------------------------------|------------------|
| <b>Unit – II</b> | <b>RAID AND INTELLIGENT STORAGE SYSTEMS</b> | <b>9 Periods</b> |
|------------------|---------------------------------------------|------------------|

RAID implementation methods-Array Components-Techniques-levels-RAID Impact on Disk Performance-Intelligent storage system: Components-Caching- Storage Provision-virtual Storage Provisioning- Types of intelligent storage systems

|                   |                                        |                  |
|-------------------|----------------------------------------|------------------|
| <b>Unit – III</b> | <b>STORAGE NETWORKING TECHNOLOGIES</b> | <b>9 Periods</b> |
|-------------------|----------------------------------------|------------------|

Block-Based Storage System-File-Based Storage System -Object-Based and Unified Storage-Fibre Channel-SAN and Its Evolution-Components of SAN-FC Connectivity-Fibre Channel Architecture-Zoning-FC SAN Topologies-Virtualization in SAN-Network-Attached Storage: Components-NAS I/O Operations-Implementations-NAS File-Sharing Protocols-IP SAN: Components-iSCSI Topologies-iSCSI Protocol Stack and Discovery

|                  |                                        |                  |
|------------------|----------------------------------------|------------------|
| <b>Unit – IV</b> | <b>BACKUP, ARCHIVE AND REPLICATION</b> | <b>9 Periods</b> |
|------------------|----------------------------------------|------------------|

Purpose-Recovery Considerations-Backup Methods-Backup Architecture-Topologies-Backup in Virtualized Environments-Data Archiving -Solution Architecture-Replication: Uses of Local Replicas-Replica Consistency -Creating Multiple Replicas -Remote Replication Technologies-Three-Site Replication-Disaster Recovery with SRDF

|                 |                                        |                  |
|-----------------|----------------------------------------|------------------|
| <b>Unit – V</b> | <b>SECURING STORAGE INFRASTRUCTURE</b> | <b>9 Periods</b> |
|-----------------|----------------------------------------|------------------|

Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls

to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.

**Total:** 30 Periods

|                            |                                                                                                                                                                                                                                                                                                                            |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. EMC Corporation, Information Storage and Management, Wiley, India<br>2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017                                                                         |
| <b>Reference Books:</b>    | Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein, Storage Networks Explained, Second Edition, Wiley, 2009                                                                                                                                                                               |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.ibm.com/it-infrastructure/storage/learning-center">https://www.ibm.com/it-infrastructure/storage/learning-center</a><br><a href="https://www.cisco.com/c/en/us/solutions/data-center-virtualization/storage.html">https://www.cisco.com/c/en/us/solutions/data-center-virtualization/storage.html</a> |

#### IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Describe the functionalities and architecture of logical and physical storage systems, including disk drive components and data center infrastructure. | Understand (K2)      |
| <b>CO2</b>                                                | Explain RAID levels, techniques, and the architecture of intelligent storage systems such as EMC Symmetrix and VNX.                                    | Understand (K2)      |
| <b>CO3</b>                                                | Illustrate different types of storage networking technologies including SAN, NAS, and IP SAN, and analyze their protocols and topologies.              | Apply (K3)           |
| <b>CO4</b>                                                | Evaluate various backup, archival, and replication strategies including solution architectures, recovery methods, and disaster recovery technologies.  | Apply (K3)           |
| <b>CO5</b>                                                | Apply security frameworks and management practices to secure and manage storage infrastructures in virtualized and cloud environments.                 | Apply (K3)           |

#### V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | 2   | 2   | 2   | 1   | 1   | -   | -   | 1    | 1    | 2    | 2    | 3    | 2    |
| <b>CO2</b>  | 3   | 2   | 2   | 2   | 2   | -   | -   | -   | -   | 1    | 1    | 2    | 2    | 3    | 2    |
| <b>CO3</b>  | 3   | 3   | 3   | 2   | 3   | 1   | 1   | -   | -   | 2    | 2    | 3    | 3    | 3    | 3    |
| <b>CO4</b>  | 3   | 3   | 3   | 3   | 3   | 2   | 2   | -   | -   | 2    | 2    | 3    | 3    | 3    | 3    |
| <b>CO5</b>  | 3   | 3   | 3   | 2   | 3   | 2   | 2   | 3   | 1   | 2    | 2    | 3    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PCS04 - Software Defined Networks

| Prerequisite                                                | Program Name                               | Sem      | Category | L | T | P | C |
|-------------------------------------------------------------|--------------------------------------------|----------|----------|---|---|---|---|
| 23CS501 - Computer Networks<br>23AD404 - Network Essentials | B.E/B.Tech. – Common to CSE, IT, and AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                        |
|---|------------------------------------------------------------------------|
| 1 | To understand the need for SDN and its data plane operations           |
| 2 | To understand the functions of control plane                           |
| 3 | To comprehend the migration of networking functions to SDN environment |
| 4 | To explore various techniques of network function virtualization       |
| 5 | To comprehend the concepts behind network virtualization               |

## III - Course Content

**Preamble:** This course introduces the fundamentals of Software Defined Networking (SDN) and Network Function Virtualization (NFV), highlighting their architectures, components, and protocols. It covers SDN planes, controllers, interfaces, and real-world applications in modern networks. The course also explores NFV infrastructure, integration with SDN, and practical use cases in virtualized environments.

|                                                                                                                                                                                                                                                                                                    |                                         |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                    | <b>INTRODUCTION</b>                     | <b>6 Periods</b> |
| Traditional Networking vs. SDN - Benefits and Challenges of SDN - SDN Standards and Bodies Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane, Control plane and Application Plane                                                                               |                                         |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                   | <b>SDN DATA PLANE AND CONTROL PLANE</b> | <b>6 Periods</b> |
| Data Plane functions and protocols – Open Flow Protocol - Flow Table - Control Plane Functions - Southbound Interface, Northbound Interface – SDN Controllers - Ryu, OpenDaylight, ONOS - Distributed Controllers Case study-Controller Placement Problem-Inter-controller Communication Protocols |                                         |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                  | <b>SDN APPLICATIONS</b>                 | <b>6 Periods</b> |
| SDN Application Plane Architecture – Network Services Abstraction Layer- Monitoring-Security-Data Center Networking-Wide Area Networks (WAN)- Service Provider Networks-Internet Service Providers (ISPs).                                                                                         |                                         |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                   | <b>NETWORK FUNCTION VIRTUALIZATION</b>  | <b>6 Periods</b> |
| Network Virtualization – Overlay Networking Protocols- Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefits and Requirements – Reference Architecture                                                                                                                                    |                                         |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                    | <b>NFV FUNCTIONALITY</b>                | <b>6 Periods</b> |
| NFV Infrastructure – Overlay Networking Protocols- Integration of SDN and NFV Virtualized Network Functions – NFV Management and Orchestration – NFV Use cases                                                                                                                                     |                                         |                  |

Total: 30 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**PRACTICAL EXERCISES:**

1. Setup your own virtual SDN lab
  - i) Virtualbox/Mininet Environment for SDN - <http://mininet.org>
  - ii) <https://www.kathara.org>
  - iii) GNS3
2. Create a simple mininet topology with SDN controller and use Wireshark to capture and visualize the OpenFlow messages such as OpenFlow FLOW MOD, PACKET IN, PACKET OUT etc.
3. Create a SDN application that uses the Northbound API to program flow table rules on the switch for various use cases like L2 learning switch, Traffic Engineering, Firewall etc.
4. Create a simple end-to-end network service with two VNFs using vim-emu  
<https://github.com/containernet/vim-emu>
5. Install OSM and onboard and orchestrate network service.

**Total: 30 Periods****Total Periods: 30+30 =60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. William Stallings, "Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud", Pearson Education, 1st Edition, 2015                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Reference Books:</b>    | 1. Ken Gray, Thomas D. Nadeau, "Network Function Virtualization", Morgan Kauffman, 2016.<br>2. Thomas D Nadeau, Ken Gray, "SDN: Software Defined Networks", O'Reilly Media, 2013.<br>3. Fei Hu, "Network Innovation through OpenFlow and SDN: Principles and Design", 1st Edition, CRC Press, 2014.<br>4. Paul Goransson, Chuck Black Timothy Culver, "Software Defined Networks: A Comprehensive Approach", 2nd Edition, Morgan Kaufmann Press, 2016.<br>5. Oswald Coker, Siamak Azodolmolky, "Software-Defined Networking with OpenFlow", 2nd Edition, O'Reilly Media, 2017. |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.udemy.com/course/sdn-and-openflow-introduction/">https://www.udemy.com/course/sdn-and-openflow-introduction/</a><br><a href="https://arxiv.org/abs/1603.07367">https://arxiv.org/abs/1603.07367</a>                                                                                                                                                                                                                                                                                                                                                       |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## IV – Course Outcomes

| On completion of the course, the students will be able to |                                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the motivations for adopting SDN and the basic operations of its data plane.          | Understand (K2)      |
| <b>CO2</b>                                                | Understand the roles and responsibilities of the control plane in SDN architecture.              | Understand (K2)      |
| <b>CO3</b>                                                | Apply the concepts involved in migrating traditional networking functions to an SDN environment. | Apply (K3)           |
| <b>CO4</b>                                                | Apply different techniques used for network function virtualization.                             | Apply (K3)           |
| <b>CO5</b>                                                | Analyze the key concepts and mechanisms behind network virtualization.                           | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | -   | -   | 2   | 1   | 1   | -   | -   | 2    | -    | 2    | -    | 2    | -    |
| <b>CO2</b>  | 3   | 3   | 2   | -   | 3   | 2   | 2   | -   | -   | 2    | -    | 2    | 2    | 3    | -    |
| <b>CO3</b>  | 3   | 3   | -   | -   | 2   | 2   | 2   | -   | -   | 1    | -    | 1    | 3    | 2    | -    |
| <b>CO4</b>  | 2   | 2   | 2   | -   | 1   | 1   | 1   | -   | -   | 1    | -    | 1    | 3    | 2    | -    |
| <b>CO5</b>  | 2   | 2   | 2   | -   | 2   | 2   | 2   | -   | -   | 1    | -    | 1    | 3    | 2    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23PCS05 - Stream Processing

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, and AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                                                           |
|---|-----------------------------------------------------------------------------------------------------------|
| 1 | Introduce Data Processing terminology, definition & concepts                                              |
| 2 | Define different types of Data Processing                                                                 |
| 3 | Explain the concepts of Real-time Data processing                                                         |
| 4 | Select appropriate structures for designing and running real-time data services in a business environment |
| 5 | Illustrate the benefits and drive the adoption of real-time data services to solve real world problems    |

## III - Course Content

**Preamble:** This course explores the architecture and technologies behind modern data systems, focusing on batch and real-time processing. It introduces data models, query languages, and tools like Apache Kafka and Spark Streaming. Emphasis is placed on building scalable, event-driven analytics systems for dynamic data environments.

|                                                                                                                                                                                                                                                                                                                                                                      |                                                   |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                      | <b>FOUNDATIONS OF DATA SYSTEMS</b>                | <b>6 Periods</b> |
| Introduction to Data Processing and Data Analytics-Stages of Data Processing-Batch Processing vs Stream Processing: Concepts and Use Cases-Transactional Data Processing and Data Mining Overview-Data Migration and Data Management Strategies-Storage, Processing, Integration, and Analytics in Data Systems-Benefits and Challenges of Data as a Service (DaaS)  |                                                   |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                     | <b>REAL-TIME DATA PROCESSING</b>                  | <b>6 Periods</b> |
| Introduction to Big Data and its Infrastructure-Real-Time vs Near Real-Time Analytics-Batch vs Stream Processing in Big Data Context-Lambda Architecture: Design and Use Cases-Kappa Architecture: Design and Use Cases-Stream Processing Concepts: Data Streams, Message Brokers, Stream Processors-Batch & Real-Time ETL Tools Overview-Storage for Streaming Data |                                                   |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                    | <b>DATA MODELS AND QUERY LANGUAGES</b>            | <b>6 Periods</b> |
| Relational Data Model and SQL-NoSQL Models: Document, Key-Value, Graph, and Network Models-Object-Relational Impedance Mismatch-Many-to-One and Many-to-Many Relationships-Schema Flexibility in NoSQL Systems-Declarative Query Languages: SQL, Cypher-SPARQL-Graph Queries in SQL and Semantic Web Concepts-CODASYL Model                                          |                                                   |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                     | <b>EVENT PROCESSING WITH APACHE KAFKA</b>         | <b>6 Periods</b> |
| Event-Driven Architecture Overview-Apache Kafka as an Event Streaming Platform-Kafka Core Concepts: Events, Producers, Consumers, Topics, Partitions, Brokers-Kafka APIs: Admin, Producer, Consumer, Streams, Connect-Kafka Use Cases and Ecosystem                                                                                                                  |                                                   |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                      | <b>REAL-TIME PROCESSING USING SPARK STREAMING</b> | <b>6 Periods</b> |
| Introduction to Structured Streaming-Concepts of Event-Time and Handling Late Data-Fault Tolerance and                                                                                                                                                                                                                                                               |                                                   |                  |

Exactly-Once Processing Semantics-Creating and Managing Streaming Datasets-Schema Inference and Partitioning-Operations on Streaming Data: Selection, Aggregation, Projection-Watermarking and Window Operations (Types of Windows)- Join Operations and Deduplication

Total: 30 Peri

**PRACTICAL EXERCISES:**

1. Install and configure MongoDB
2. Design and implement application using MongoDB
3. Query the designed system using MongoDB
4. Set up Apache Kafka and create a basic event stream
5. Real-time data pipeline using Kafka
6. Real-time stream processing using Spark Streaming
7. Micro-batch processing application using Spark
8. Real-time fraud and anomaly detection
9. Real-time personalization or marketing using streaming data

Total: 30 Periods

Total Periods: 30+30 =60 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Karau, H., Konwinski, A., Wendell, P., & Zaharia, M. (2015). Learning Spark: Lightning-Fast Big Data Analysis. O'Reilly Media.<br>2. Streaming Systems: The What, Where, When and How of Large-Scale Data Processing by Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication<br>3. Practical Real-time Data Processing and Analytics : Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing. |
| <b>Reference Books:</b>    | 1. <a href="https://spark.apache.org/docs/latest/streaming-programming-guide.html">https://spark.apache.org/docs/latest/streaming-programming-guide.html</a><br>2. <a href="https://kafka.apache.org">Kafka.apache.org</a>                                                                                                                                                                                                                                  |
| <b>MOOC/Web Platforms:</b> | <a href="https://developer.confluent.io/learn-kafka/">https://developer.confluent.io/learn-kafka/</a><br><a href="https://spark.apache.org/docs/latest/structured-streaming-programming-guide.html">https://spark.apache.org/docs/latest/structured-streaming-programming-guide.html</a>                                                                                                                                                                    |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand foundational data processing models and streaming concepts.           | Understand (K2)      |
| <b>CO2</b>                                                | Explain big data architectures and real-time analytics frameworks.               | Understand (K2)      |
| <b>CO3</b>                                                | Compare different data models and query languages suited for stream processing.  | Understand (K2)      |
| <b>CO4</b>                                                | Design and implement event-driven streaming applications using Apache Kafka.     | Apply (K3)           |
| <b>CO5</b>                                                | Develop fault-tolerant, scalable real-time data pipelines using Spark Streaming. | Apply (K3)           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 2   | 2   | 2   | -   | -   | -   | -   | -    | 2    | 2    | 2    | 3    | 3    |
| CO2         | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | 2    | 2    | 2    | 3    | 3    |
| CO3         | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | 2    | 2    | 2    | 3    | 3    |
| CO4         | 3   | 2   | 2   | 3   | 3   | -   | -   | -   | -   | -    | 2    | 3    | 3    | 3    | 3    |
| CO5         | 3   | 3   | 3   | 3   | 3   | -   | -   | -   | -   | -    | 2    | 3    | 3    | 3    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401

## I - Course Name: 23PCS06 - Security and Privacy in Cloud

| Prerequisite | Program Name                             | Sem      | Category | L | T | P | C |
|--------------|------------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech. – Common to CSE, IT, & AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|   |                                                                               |
|---|-------------------------------------------------------------------------------|
| 1 | To introduce Cloud Computing terminology, definition & concepts.              |
| 2 | To understand the security design and architectural considerations for Cloud. |
| 3 | To understand the Identity, Access control in Cloud.                          |
| 4 | To follow best practices for Cloud security using various design patterns.    |
| 5 | To be able to monitor and audit cloud applications for security.              |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                   |                                                       |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------|
| <b>Preamble:</b> This course provides a comprehensive overview of cloud security concepts, design principles, and technologies essential for safeguarding cloud environments. Students will explore access control, infrastructure protection, security design patterns, and privacy management in modern cloud systems.                          |                                                       |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                   | <b>FUNDAMENTALS OF CLOUD SECURITY CONCEPTS</b>        | <b>7 Periods</b> |
| Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non repudiation- Cloud deployment models, Cloud service models, Cloud- Cloud security best practices.                                                                                                                                                 |                                                       |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                  | <b>SECURITY DESIGN &amp; INFRASTRUCTURE SECURITY</b>  | <b>6 Periods</b> |
| Security design principles for Cloud Computing - comprehensive data protection - End-to-end access control - Common attack vectors and threats- Infrastructure Security: The Application-Level Data Security and Storage: Aspects of Data Security, Data Security Mitigation.                                                                     |                                                       |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                 | <b>ACCESS CONTROL AND CLOUD SECURITY TECHNOLOGIES</b> | <b>6 Periods</b> |
| Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control- Network security in the cloud, Virtualization security technologies, Cloud-based security solutions- network access control options.                                                                  |                                                       |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                  | <b>CLOUD SECURITY DESIGN PATTERNS</b>                 | <b>6 Periods</b> |
| Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud.                                                                                                                                                                   |                                                       |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                   | <b>MONITORING, AUDITING, AND PRIVACY</b>              | <b>5 Periods</b> |
| Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts – Auditing- What Is Privacy, What Is the Data Life Cycle, What Are the Key Privacy Concerns in the Cloud, Who Is Responsible for Protecting Privacy, Changes to Privacy Risk Management. |                                                       |                  |

Total: 30 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**PRACTICAL EXERCISES:**

1. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm not present in Cloud Sim.
2. Simulate resource management using CloudSim.
3. Simulate log forensics using cloud sim.
4. Simulate a secure file sharing using a cloud sim.
5. Implement data anonymization techniques over the simple dataset (masking, k-anonymization, etc).
6. Implement any encryption algorithm to protect the images.
7. Implement any image obfuscation mechanism.
8. Implement a role-based access control mechanism in a specific scenario.
9. Implement an attribute-based access control mechanism based on a particular scenario.
10. Develop a log monitoring system with incident management in the cloud.

**Total: 30 Periods****Total Periods: 30+30 = 60 Periods**

|                            |                                                                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, — Cloud Computing , Wiley 2013<br>2. Dave shackleford, — Virtualization Security, SYBEX a wiley Brand 2013.<br>3. Mather, Kumaraswamy and Latif, — Cloud Security and Privacy, OREILLY 2011                                    |
| <b>Reference Books:</b>    | 1. Mark C. Chu-Carroll — Code in the Cloud  ,CRC Press, 2011.<br>2. Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi                                                                                          |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.coursera.org/learn/cloud-computing-security?utm_source=chatgpt.com">https://www.coursera.org/learn/cloud-computing-security?utm_source=chatgpt.com</a><br><a href="https://www.youtube.com/watch?v=fKUnblWDK14">https://www.youtube.com/watch?v=fKUnblWDK14</a> |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                         | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the basic components of cloud computing and cloud security.                  | Understand (K2)      |
| <b>CO2</b>                                                | Describe the security design principles and architectural considerations for the cloud. | Understand (K2)      |
| <b>CO3</b>                                                | Apply best practices for cloud security using different security design patterns.       | Apply (K3)           |
| <b>CO4</b>                                                | Apply methods to monitor and audit cloud applications for security.                     | Apply (K3)           |
| <b>CO5</b>                                                | Analyze identity and access control mechanisms used in cloud environments.              | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23PCS07 - ETHICAL HACKING

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                                             |
|----|---------------------------------------------------------------------------------------------|
| 1. | Understand the fundamentals of ethical hacking, penetration testing, and security auditing. |
| 2. | Learn various hacking techniques and corresponding countermeasures.                         |
| 3. | Explore tools and methodologies for vulnerability assessment and exploitation.              |
| 4. | Study legal and ethical aspects of cybersecurity and ethical hacking practices.             |
| 5. | Gain hands-on experience in simulating attacks and securing systems.                        |

## III - Course Content

**Preamble:** Ethical Hacking introduces principles and practices of identifying, testing, and securing vulnerabilities in computer systems and networks. The subject covers penetration testing methodologies, threat analysis, exploit mitigation, and legal/ethical considerations. Students learn hands-on techniques and tools to assess security posture and implement defensive measures.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                               |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>INTRODUCTION</b>                                           | <b>6 Periods</b> |
| Ethical Hacking Overview - Role of Security and Penetration Testers - Penetration-Testing Methodologies- Laws of the Land Overview of TCP/IP - The Application Layer - The Transport Layer - The Internet Layer - IP Addressing - Network and Computer Attacks - Malware - Protecting Against Malware Attacks - Intruder Attacks - Addressing Physical Security- Information Security Program: The Process of Information Security- Component Parts of Information Security Program- Risk Analysis and Ethical Hacking |                                                               |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>NETWORK INTELLIGENCE GATHERING AND SCANNING TECHNIQUES</b> | <b>6 Periods</b> |
| Footprinting Concepts - Footprinting through Search Engines- Web Services- Social Networking Sites- Website- Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Introduction to Scanning Objectives Scanning Methodology Tools - Scanning Techniques - Scanning Beyond IDS and Firewall                                                                                                                                                                                 |                                                               |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>PREPARING FOR A HACK</b>                                   | <b>6 Periods</b> |
| Introduction Cracking Passwords Password- Cracking Websites Password- Guessing Password -Cracking Tools- Password Cracking -Countermeasures Escalating -Privileges Executing -Applications Keyloggers and Spyware- Technical Preparation- Managing the Engagement Reconnaissance: Social Engineering- Physical Security- Internet Reconnaissance                                                                                                                                                                       |                                                               |                  |
| <b>UNIT – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>ENUMERATION CONCEPTS</b>                                   | <b>6 Periods</b> |
| Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss- Preparing for the Next Phase Exploitation: Intuitive Testing- Evasion- Threads and Groups                                                                                                               |                                                               |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>NETWORK PROTECTION SYSTEMS</b>                             | <b>6 Periods</b> |

Access Control Lists -Cisco Adaptive Security Appliance -Firewall Configuration and Risk Analysis Tools for Firewalls and Routers- Intrusion Detection and Prevention Systems -Network Based and Host Based IDSs - IPSs Web Filtering -Security Incident – Incident Management- Security Policy -Response Teams -Honeypots

**TOTAL: 30 Periods**

#### PRACTICAL EXERCISES:

1. Install Kali or Backtrack Linux / Metasploitable/ Windows XP
2. Practice the basics of reconnaissance.
3. Using FOCA / SearchDiggity tools, extract metadata and expanding the target list.
4. Aggregates information from public databases using online free tools like Paterva's Maltego.
5. Information gathering using tools like Robtex.
6. Scan the target using tools like Nessus.
7. View and capture network traffic using Wireshark.
8. Automate dig for vulnerabilities and match exploits using Armitage

**TOTAL: 30 Periods**

**TOTAL:30+30=60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. EC-Council. (2021). Certified Ethical Hacker (CEH) v11: Official Courseware. EC-Council.</li> <li>2. Kim, D., &amp; Solomon, M. G. (2016). Fundamentals of Information Systems Security (3rd ed.). Jones &amp; Bartlett.</li> <li>3. Grimes, R. A. (2019). Hacking the Hacker: Learn from the Experts Who Take Down Hackers. Wiley.</li> </ol>    |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Harper, A., Harris, S., Ness, J., Lenkey, C., &amp; Williams, K. (2011). Gray Hat Hacking: The Ethical Hacker's Handbook (3rd ed.). McGraw-Hill.</li> <li>2. Skoudis, E., &amp; Liston, T. (2006). Counter Hack Reloaded. Prentice Hall.</li> <li>3. Erickson, J. (2018). Hacking: The Art of Exploitation (2nd ed.). No Starch Press.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc22_cs13/preview">https://onlinecourses.nptel.ac.in/noc22_cs13/preview</a><br><a href="https://nptel.ac.in/courses/106105217">https://nptel.ac.in/courses/106105217</a>                                                                                                                                                                        |

#### IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the basic principles and scope of ethical hacking.                                  | Understand (K2)      |
| <b>CO2</b>                                                | Understand the processes involved in scanning, enumeration, and basic exploitation techniques. | Understand (K2)      |
| <b>CO3</b>                                                | Apply hands-on tools to identify and analyze system and web vulnerabilities.                   | Apply (K3)           |
| <b>CO4</b>                                                | Apply techniques to assess cybersecurity defenses and suggest suitable countermeasures.        | Apply (K3)           |
| <b>CO5</b>                                                | Analyze and perform ethical hacking tasks in simulated environments.                           | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## ✓ Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-------|-----------|-----------|
| CO-1        | 3        | 2        | -        | -        | -        | 2        | 3        | 2        | -        | -         | -         | 2         | 2     | 2         | 3         |
| CO-2        | 3        | 3        | 3        | -        | 3        | -        | -        | -        | -        | -         | -         | 3         | 2     | 2         | 2         |
| CO-3        | 3        | 3        | 3        | 3        | 3        | 2        | -        | -        | -        | -         | -         | 3         | 3     | 3         | 1         |
| CO-4        | 3        | 3        | 2        | 3        | 3        | -        | -        | -        | -        | -         | -         | 3         | 2     | 2         | 1         |
| CO-5        | 3        | 3        | 3        | 3        | 3        | -        | -        | -        | -        | -         | -         | 3         | 3     | 1         | 3         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PCS08 - Digital and Mobile Forensics**

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                                                      |
|----|--------------------------------------------------------------------------------------|
| 1. | To understand the fundamentals of digital forensic science and legal considerations. |
| 2. | To learn techniques for investigating digital crimes and handling cyber evidence.    |
| 3. | To familiarize with frameworks and best practices for digital forensic readiness.    |
| 4. | To analyze forensic techniques and tools specific to iOS platforms.                  |
| 5. | To explore Android forensics, including file systems, rooting, and data recovery.    |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                         |                                          |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------|
| <b>Preamble:</b> This course introduces students to the principles and tools of digital and mobile forensics. It covers methodologies for digital crime investigation, forensic readiness, and in-depth techniques for analyzing iOS and Android platforms.                                             |                                          |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                         | <b>INTRODUCTION TO DIGITAL FORENSICS</b> | <b>6 Periods</b> |
| Fundamentals of forensic science and digital forensics-Types of digital evidence-Digital forensics process: identification, collection, examination, analysis, presentation-Chain of custody, evidence integrity, evidence dynamics.                                                                    |                                          |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                        | <b>DIGITAL CRIME AND INVESTIGATION</b>   | <b>6 Periods</b> |
| Digital crimes: hacking, cyber terrorism, online fraud-Legal frameworks: substantive criminal law, procedural aspects-Role of Interpol and CERT-In in cybercrime handling-Investigation methods: chain of evidence, seizure and search protocols-International cooperation in cybercrime investigation. |                                          |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                       | <b>DIGITAL FORENSIC READINESS</b>        | <b>6 Periods</b> |
| Enterprise vs. law enforcement readiness-Frameworks and methodologies: NIST, ISO-Logging, alerting, and documentation practices-Proactive threat hunting strategies-Case handling policies and incident response planning                                                                               |                                          |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                        | <b>IOS FORENSICS</b>                     | <b>6 Periods</b> |
| iOS architecture: system security, sandboxing, data encryption-Jailbreaking methods and risks-Acquisition and analysis tools: Oxygen Forensics, MobilEdit, Elcomsoft iOS Toolkit-Data artifacts: SMS, call logs, GPS, WhatsApp, photos, app cache- Case study: iOS data leak investigation              |                                          |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                         | <b>ANDROID FORENSICS</b>                 | <b>6 Periods</b> |
| Android OS structure, boot process, rooting techniques-File systems: ext3/ext4, YAFFS2-Tools: ADB, Oxygen, Cellebrite, Andriller-Android app analysis: decompiling APKs, Dalvik cache, SQLite databases- case study: WhatsApp & Telegram data reconstruction from rooted device.                        |                                          |                  |

**TOTAL: 30 Periods**



**PRACTICAL EXERCISES:**

1. Installation of Sleuth Kit on Linux and analysis of disk images
2. Data extraction from call logs using Sleuth Kit
3. Data extraction from SMS and contacts using Sleuth Kit
4. Installation and usage of Mobile Verification Toolkit (MVT) for decrypting iOS backups
5. Processing and parsing records from iOS system
6. Extraction of installed applications from Android devices
7. Extraction of diagnostic information from Android devices via ADB
8. Generation of unified chronological timeline of extracted records

**TOTAL : 30 Periods****TOTAL : 30+30=60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Eoghan Casey, Digital Evidence and Computer Crime, Academic Press, 3rd Edition.</li> <li>2. Andrew Hoog, Android Forensics: Investigation, Analysis and Mobile Security for Google Android, Elsevier.</li> <li>3. Chuck Easttom, "An In-depth Guide to Mobile Device Forensics", First Edition, CRC Press, 2022</li> </ol> |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.</li> </ol>                                                                                                                                                                                         |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/106105217">https://nptel.ac.in/courses/106105217</a>                                                                                                                                                                                                                                                                            |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                         | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the foundational concepts and legal framework of digital forensics.             | Understand (K2)      |
| <b>CO2</b>                                                | Apply investigation procedures for cybercrimes and interpret legal implications.        | Apply (K3)           |
| <b>CO3</b>                                                | Develop a digital forensic readiness strategy for enterprise and law enforcement needs. | Apply (K3)           |
| <b>CO4</b>                                                | Analyze iOS forensic tools and extract artifacts from mobile devices.                   | Analyze (K4)         |
| <b>CO5</b>                                                | Analyze Android forensics tools and reconstruct communication data from devices.        | Analyze (K4)         |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO1</b>  | 3    | 2    | -    | -    | 2    | 2    | -    | -    | -    | 1     | -     | 2     | 3     | 2     | -     |
| <b>CO2</b>  | 3    | 3    | 3    | 2    | 3    | 3    | 2    | -    | 2    | 2     | -     | 2     | 3     | 3     | -     |
| <b>CO3</b>  | 2    | 3    | 3    | 3    | 2    | 2    | -    | -    | 2    | 1     | -     | 2     | 3     | 3     | -     |
| <b>CO4</b>  | 3    | 3    | 3    | 3    | 3    | 3    | 2    | -    | 2    | 1     | -     | 3     | 3     | 3     | -     |
| <b>CO5</b>  | 3    | 3    | 3    | 3    | 3    | 3    | 2    | -    | 2    | 2     | -     | 3     | 3     | 3     | -     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each



## I - Course Name: 23PCS09 -SOCIAL NETWORK SECURITY

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                                                                      |
|----|----------------------------------------------------------------------------------------------------------------------|
| 1. | Understand the architecture and functioning of social networks and the privacy concerns associated with them.        |
| 2. | Explore various types of attacks on social networks and mechanisms for detection and mitigation.                     |
| 3. | Study privacy-preserving algorithms, access control models, and secure communication mechanisms in social platforms. |
| 4. | Familiarize students with tools and methods to analyze network structures and secure user data.                      |
| 5. | Discuss real-world case studies and recent research trends in social network security and user profiling.            |

## III - Course Content

**Preamble:** Social network security aims to protect users' data, privacy, and online interactions from misuse and cyber threats. It ensures safe communication by preventing unauthorized access, identity theft, and malicious activities.

|                                                                                                                                                                                                                                                                                                                                                                                                      |                                  |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                      | <b>Need of software Security</b> | <b>6 Periods</b> |
| Web Intelligence Thinking and Intelligent Web Applications- Limitations of Today's Web - The Next Generation Web- Machine Intelligence- Semantic Web - Semantic Road Map- Logic on the Semantic Web - Social Network analysis- Development of Social Network Analysis- Key concepts and measures in network analysis - Major paradigms- for understanding privacy and security                       |                                  |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                     | <b>Secure Software Design</b>    | <b>6 Periods</b> |
| Knowledge Representation for the Semantic Web Ontologies and their role in the semantic web- Ontologies Languages for the Semantic Web – Resource Description Framework(RDF) / RDF Schema- Ontology Web Language (OWL)- UML- XML/XML Schema                                                                                                                                                          |                                  |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                    | <b>Security Risk Management</b>  | <b>6 Periods</b> |
| Extracting evolution of Web Community from a Series of Web Archive- Detecting communities in social networks- Evaluating communities- Methods for community detection and mining- Applications of community mining algorithms- Tools for detecting communities social network infrastructures and communities- Big data and Privacy                                                                  |                                  |                  |
| <b>UNIT -IV</b>                                                                                                                                                                                                                                                                                                                                                                                      | <b>Security Testing</b>          | <b>6 Periods</b> |
| Understanding and predicting human behavior for social communities- User data Management- Inference and Distribution- Context- Awareness- Privacy in online social networks- Trust in online environment- What is Neo4j- Nodes- Relationships- Properties. - Identifying fraudulent entities in online social networks - Phishing in OSM & Identifying fraudulent entities in online social networks |                                  |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                      | <b>Secure Project Management</b> | <b>6 Periods</b> |
| Understand the access control requirements for Social Network- Enforcing Access Control Strategies- Authentication and Authorization- Roles-based Access Control- Host- storage and network access control options- Firewalls- Authentication- and Authorization in Social Network- Identity & Access Management-                                                                                    |                                  |                  |

Single Sign-on- Identity Federation - Case Study: An Analysis of Demographic and Behaviour Trends using Social Media: Facebook- Twitter and Instagram

**TOTAL: 30 Periods**

**PRACTICAL EXERCISES:**

1. Design your own social media application
2. Create a Network model using Neo4j
3. Read and write Data from the Graph Database
4. Find "Friend of Friends" using Neo4j
5. Implement secure search in social media
6. Create a simple Security & Privacy detector
7. Mini Project using Flask / Neo4

**TOTAL : 30 Periods**

**TOTAL : 30+30=60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Aggarwal, C. C. (2011). Social network data analytics. Springer.</li> <li>2. Zheleva, E. (2012). Privacy in social networks. Synthesis Lectures on Information Security.</li> <li>3. Hansen, D., Schneiderman, B., &amp; Smith, M. A. (2010). Analyzing social media networks with NodeXL. Elsevier.</li> </ol>                                                                                                                        |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Boyd, D., &amp; Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. Journal of Computer-Mediated Communication.</li> <li>2. Gupta, B. B., Perez, G. M., &amp; Agrawal, D. P. (2021). Social network security: Issues, challenges, and solutions. Springer.</li> <li>3. Wasserman, S., &amp; Faust, K. (1994). Social network analysis: Methods and applications. Cambridge University Press.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <ol style="list-style-type: none"> <li>1. Coursera – Security &amp; Privacy in Social Media (University of Maryland): <a href="https://www.coursera.org/learn/security-social-media">https://www.coursera.org/learn/security-social-media</a></li> </ol>                                                                                                                                                                                                                         |

**IV - Course Outcomes**

| On completion of the course the students will be able to |                                                                                                              | Bloom's Level Mapped |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                               | Describe security challenges and privacy issues in social networks.                                          | Understand (K2)      |
| <b>CO2</b>                                               | Understand how access control and privacy-preserving mechanisms are applied in social media.                 | Understand (K2)      |
| <b>CO3</b>                                               | Apply techniques to analyze different types of attacks and their detection in online social networks (OSNs). | Apply (K3)           |
| <b>CO4</b>                                               | Apply privacy models and graph anonymization techniques to protect user data.                                | Apply (K3)           |
| <b>CO5</b>                                               | Analyze and use security tools to investigate and secure social network platforms.                           | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | 2        | -        | -        | -        | 2        | 3        | 2        | -        | -        | -         | 2         | 2         | -         |           | 3         |
| CO-2        | 3        | 3        | 2        | -        | -        | -        | -        | -        | -        | -        | -         | 3         | 2         | -         |           | 3         |
| CO-3        | 3        | 3        | 3        | 2        | 3        | 2        | -        | -        | -        | -        | -         | 3         | 3         | -         |           | 3         |
| CO-4        | 3        | 3        | 2        | 3        | 3        | -        | -        | -        | -        | -        | -         | 3         | 2         | -         |           | 3         |
| CO-5        | 3        | 3        | 3        | 3        | 3        | -        | -        | -        | -        | -        | -         | 3         | 3         | 2         |           | 3         |

Mapping: 1-Low- 2-Medium- 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PCS10 - Modern Cryptography

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                                                                             |
|----|-----------------------------------------------------------------------------------------------------------------------------|
| 1. | Introduce the fundamental concepts and goals of modern cryptography                                                         |
| 2. | Familiarize students with classical and modern encryption techniques used in securing digital data.                         |
| 3. | Provide a deep understanding of symmetric key algorithms (e.g., AES) and public key cryptographic systems (e.g., RSA, ECC). |
| 4. | Explore cryptographic hash functions, message authentication codes (MACs), and digital signatures.                          |
| 5. | Examine key management strategies, key exchange protocols, and infrastructure such as Public Key Infrastructure (PKI).      |

## III - Course Content

**Preamble:** Modern Cryptography provides the principles and practices of securing digital information through mathematical foundations and encryption techniques. The subject explores symmetric and asymmetric algorithms, hash functions, digital signatures, and key management.

|                                                                                                                                                                                                                                                                                  |                                                  |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                  | <b>Mathematical Foundations for Cryptography</b> | <b>6 Periods</b> |
| Number Theory: Primes-GCD- Modular Arithmetic-Euler's Theorem-CRT- Algebraic Structures: Groups-Rings-Fields- Complexity Theory: P, NP-One-way functions-Trapdoor functions- probability and Randomness in Cryptographic Context-.                                               |                                                  |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                 | <b>Symmetric Key Cryptography</b>                | <b>6 Periods</b> |
| Classical Ciphers and Cryptanalysis (Caesar, Vigenère, Substitution-Block Ciphers: DES, AES, S-boxes, Key Scheduling-Modes of Operation: ECB, CBC, CFB, OFB, CTR, GCM-Stream Ciphers: RC4, Salsa20, ChaCha-Message Authentication Codes: HMAC, CMAC                              |                                                  |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                | <b>Asymmetric Cryptography and Protocols</b>     | <b>6 Periods</b> |
| RSA, ElGamal, Diffie-Hellman Key Exchange -Digital Signatures: RSA, DSA, ECDSA-Elliptic Curve Cryptography (ECC): Group Law, Point Addition-Key Management and Distribution-Public Key Infrastructure (PKI), X.56 Certificates                                                   |                                                  |                  |
| <b>UNIT – IV</b>                                                                                                                                                                                                                                                                 | <b>Advanced Cryptographic Constructs</b>         | <b>6 Periods</b> |
| Cryptographic Hash Functions: Properties, MD5, SHA-2/3-Zero-Knowledge Proofs and Commitment Schemes- Homomorphic Encryption (Paillier, BGV - overview)-Secure Multi-party Computation (MPC) and Secret Sharing-Lattice-based and Post-Quantum Cryptography (NTRU, LWE, Ring-LWE) |                                                  |                  |

| Unit – V                                                                                                                                                                                                                                                                                                            | Applications, Trends & Security Practices | 6 Periods |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------|
| Blockchain, Cryptocurrencies (Bitcoin, Ethereum)-Quantum Cryptography and Quantum Key Distribution-Functional Encryption, Obfuscation (Overview)-TLS/SSL, VPNs, IPsec – Secure Communication Protocols-Cryptanalysis Techniques and Case Studies-Hands-on: OpenSSL, GPG, Practical Attacks (Timing, Padding Oracle) |                                           |           |

**TOTAL: 30 Periods****LIST OF EXPERIMENTS:**

1. Implementation of Euclidean Algorithm and Extended Euclidean Algorithm for GCD.
2. Demonstration of Modular Arithmetic operations (addition, multiplication, inverse).
3. Implementation of Classical Ciphers – Caesar, Vigenère, Playfair, Substitution.
4. Cryptanalysis of classical ciphers using frequency analysis.
5. Implementation of DES algorithm with key scheduling and encryption/decryption.
6. Implementation of AES algorithm (128-bit key) with S-box operations.
7. Study and demonstration of stream cipher (RC4 or ChaCha20).
8. Implementation of RSA algorithm – key generation, encryption, and decryption.
9. Demonstration of Diffie–Hellman Key Exchange Protocol.
10. Implementation of Digital Signatures using RSA/DSA.

**TOTAL : 30 PERIODS****TOTAL : 30+30=60 PERIODS**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Stallings, W. (2017). Cryptography and network security: Principles and practice (7th ed.). Pearson.</li> <li>2. Katz, J., &amp; Lindell, Y. (2020). Introduction to modern cryptography (3rd ed.). CRC Press.</li> <li>3. Paar, C., &amp; Pelzl, J. (2010). Understanding cryptography: A textbook for students and practitioners. Springer.</li> </ol>                                                              |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Schneier, B. (1996). Applied cryptography: Protocols, algorithms, and source code in C (2nd ed.). Wiley.</li> <li>2. William Stallings, "Cryptography and Network Security: Principles and Practice", PHI 3rd Edition, 2006..</li> <li>3. Forouzan, B. A. (2008). Cryptography and network security. McGraw-Hill.</li> <li>4. Mao, W. (2004). Modern cryptography: Theory and practice. Pearson Education.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc22_cs03/preview">https://onlinecourses.nptel.ac.in/noc22_cs03/preview</a>                                                                                                                                                                                                                                                                                                                                         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR Colleges of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain symmetric and asymmetric cryptographic principles.                                   | Apply (K3)           |
| CO2                                                       | Apply classical and modern encryption techniques to secure communication.                    | Apply (K3)           |
| CO3                                                       | Analyze cryptographic algorithms (e.g., AES, RSA, ECC) in terms of security and performance. | Analyze (K4)         |
| CO4                                                       | Evaluate hash functions, signatures, and key protocols in secure systems.                    | Analyze (K4)         |
| CO5                                                       | Implement crypto algorithms and solve practical security problems using tools/libraries.     | Evaluate (K5)        |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | 3        | -        | 2        | -        | -        | -        | -        | -        | -        | -         | -         | 2         | -         | -         | 3         |
| CO-2        | 3        | 3        | 2        | -        | -        | -        | -        | -        | -        | -        | -         | -         | 3         | -         | -         | 3         |
| CO-3        | 3        | 3        | 3        | 3        | 2        | -        | -        | -        | -        | -        | -         | -         | 3         | 2         | -         | 3         |
| CO-4        | 3        | 3        | 2        |          | 2        | -        | -        | -        | -        | -        | -         | -         | 3         | 2         | -         | 3         |
| CO-5        | 3        | 3        |          | 2        | 3        | -        | -        | -        | -        | -        | -         | -         | 3         | 3         | 2         | 3         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PCS11 - Engineering Secure Software Systems**

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                                                                                                                        |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Understand and analyze software security principles to identify potential vulnerabilities and threats in software systems.                             |
| 2. | Explore secure software development lifecycle (SDLC) models and incorporate security practices throughout the software engineering process.            |
| 3. | Apply threat modeling and risk assessment techniques to design secure software architectures.                                                          |
| 4. | Implement secure coding practices to mitigate common software vulnerabilities such as buffer overflows- injection attacks- and insecure data handling. |
| 5. | Evaluate and verify software security using testing methods- static and dynamic analysis- and code reviews.                                            |

**III - Course Content**

**Preamble:** Engineering Secure Software Systems emphasizes the principles and practices of building software with security as a core requirement. The subject covers secure software design, threat modeling, vulnerability assessment, and defensive coding techniques. It integrates security across the software development life cycle (SDLC) to prevent flaws and attacks.

|                                                                                                                                                                                                                                                                                                                                                                                               |                                              |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                               | <b>Foundations of Software Security</b>      | <b>6 Periods</b> |
| Software Assurance and Software Security-Threats to Software Security-Sources of Software Insecurity-Benefits of Detecting Software Security Issues Early-Properties of Secure Software-Memory-Based Attacks: Heap and Stack-Defense Mechanisms- Return-Oriented Programming (ROP)-Use-After-Free and Format String Vulnerabilities-Updated Tools & Examples (e.g.- GDB- Valgrind)            |                                              |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                              | <b>Secure Software Design Principles</b>     | <b>6 Periods</b> |
| Requirements Engineering for Secure Software-SQUARE Process Model-Secure Design Principles-Threat Modeling-Stack Inspection-Buffer Overflow-Code Injection- Session Hijacking - OWASP Top 10 (2023) overview (A1–A10 vulnerabilities)-Secure Coding Practices in C/C++ and Java-Examples of Secure API Design                                                                                 |                                              |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                             | <b>Security Risk Management</b>              | <b>6 Periods</b> |
| Risk Management Life Cycle- Risk Profiling- Risk Exposure Factors- Risk Evaluation and Mitigation-Threat and Vulnerability Management- NIST 800-64 Secure SDLC Framework- Risk-based Prioritization using DREAD model- Case Study: Real-world incident response and mitigation                                                                                                                |                                              |                  |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>Security Testing and Evaluation</b>       | <b>6 Periods</b> |
| Traditional Software Testing-Secure Software DevelopmentLife Cycle-Risk-Based Security Testing-Penetration Testing – Planning and Scoping- Enumeration-Web Application Exploitation-Client-Side Attacks- Post Exploitation- Bypassing Firewalls and Avoiding Detection- Static and Dynamic Application Security Testing (SAST/DAST)- OWASP ZAP- Burp Suite- Fuzz Testing- Dependency Scanning |                                              |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                               | <b>Secure Project and Process Management</b> | <b>6 Periods</b> |
| Governance and Security- Enterprise Security Frameworks- Security and Project Management- Maturity of                                                                                                                                                                                                                                                                                         |                                              |                  |

Practice- DevSecOps Principles& Pipeline Integration- Overview of Compliance Standards (e.g.- ISO 27001- GDPR)- Agile Security – Security in Scrum/CI-CD

**TOTAL: 30 Periods**

### PRACTICAL EXERCISES

1. Implement the SQL injection attack.
2. Implement the Buffer Overflow attack.
3. Implement Cross Site Scripting and Prevent XSS.
4. Perform Penetration testing on a web application to gather information about the system, then initiate XSS and SQL injection attacks using tools like Kali Linux.
5. Develop and test the secure test cases
6. Penetration test using kali Linux

**TOTAL : 30 Periods**

**TOTAL : 30+30=60 Periods**

|                            |                                                                                                                                                                                                                                                                 |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Julia H. Allen- "Software Security Engineering"- Pearson Education- 2008<br>2. Evan Wheeler- "Security Risk Management: Building an Information Security Risk Management Program from the Ground Up"- First edition- Syngress Publishing- 2011               |
| <b>Reference Books:</b>    | 1. Mike Shema, "Hacking Web Apps: Detecting and Preventing Web Application Security Problems", First edition, Syngress Publishing, 2012<br>2. Bryan Sullivan and Vincent Liu, "Web Application Security, A Beginner's Guide", Kindle Edition, McGraw Hill, 2012 |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/106106199">https://nptel.ac.in/courses/106106199</a>                                                                                                                                                                       |

### IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the secure software engineering lifecycle and basic threat-modeling techniques.   | Understand (K2)      |
| <b>CO2</b>                                                | Explain the secure design principles and architecture strategies for building safe software. | Understand (K2)      |
| <b>CO3</b>                                                | Apply secure coding practices to identify and mitigate common software vulnerabilities.      | Apply (K3)           |
| <b>CO4</b>                                                | Analyze source code using static and dynamic analysis tools to assess security issues.       | Analyze (K4)         |
| <b>CO5</b>                                                | Analyze secure software modules using industry-compliant standards and guidelines.           | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | 2        | -        | 2        | -        | 3        | -        | 2        | -        | -        | -         | 2         | 2         | -         | -         | 3         |
| CO-2        | 3        | 3        | 3        | -        | -        | -        | -        | -        | -        | -        | -         | 3         | 2         | -         | -         | 3         |
| CO-3        | 3        | 3        | 3        | 3        | 3        | -        | -        | -        | -        | -        | -         | 3         | 3         | -         | -         | 3         |
| CO-4        | 3        | 3        | 3        | 3        | 3        | -        | -        | -        | -        | -        | -         | 3         | 2         | -         | -         | 3         |
| CO-5        | 3        | 3        | 3        | 3        | 3        | -        | -        | -        | -        | -        | -         | 3         | 3         | 2         | -         | 3         |

Mapping: 1-Low- 2-Medium- 3-High (Mapping value based on usage of Action verbs in each CO)

  
**Chairperson-Board of Studies,**  
**Department of Information Technology,**  
**NPR College of Engineering & Technology**  
**(Autonomous),**  
**Natham, Dindigul 624401**

**I - Course Name: 23PCS12 - Cryptocurrency and Blockchain Technologies**

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                                     |
|----|---------------------------------------------------------------------|
| 1. | To understand the basics of Blockchain                              |
| 2. | To learn Different protocols and consensus algorithms in Blockchain |
| 3. | To learn the Blockchain implementation frameworks                   |
| 4. | To learn the Blockchain implementation frameworks                   |
| 5. | To experiment the Hyperledger Fabric, Ethereum networks             |

**III - Course Content**

**Preamble:** This course provides an in-depth exploration of Blockchain Technology, from its basic principles to its advanced applications. The course is structured to offer a solid understanding of Blockchain fundamentals, including the architecture, consensus mechanisms, and cryptographic foundations that underpin modern cryptocurrencies and decentralized systems.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>INTRODUCTION TO BLOCKCHAIN</b>        | <b>6 Periods</b> |
| Introduction to Blockchain – Characteristics and Benefits – Distributed Ledger Technology – Public and Private Ledgers – Blockchain Architecture – Block Structure: Header, Metadata, and Transactions – Cryptographic Hash Function – Properties of Hash Functions – Hash Pointer and Merkle Tree – Types of Blockchain: Public, Private, Consortium – Permissioned and Permissionless Blockchains Signatures                                                     |                                          |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>BITCOIN AND CRYPTOCURRENCY</b>        | <b>6 Periods</b> |
| Introduction to Cryptocurrency – Creation of Coins – Payments and Double Spending – FORTH: The Precursor to Bitcoin Scripting – Bitcoin Scripts – Bitcoin Peer-to-Peer (P2P) Network – Transactions in the Bitcoin Network – Block Mining – Block Propagation and Block Relay-Smart Contracts and Use Cases in Blockchain                                                                                                                                          |                                          |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>BITCOIN CONSENSUS</b>                 | <b>6 Periods</b> |
| Bitcoin Consensus Mechanisms – Proof of Work (PoW): Hashcash PoW, Bitcoin PoW – Attacks on PoW: 51% Attack, Sybil Attack – Mining Difficulty and Incentives – Mining Pools and Centralization Risks – Monopoly Problem in Mining – Alternative Consensus Mechanisms: Proof of Stake (PoS), Proof of Burn (PoB), Proof of Elapsed Time (PoET) – Permissioned Blockchain Models and Use Cases                                                                        |                                          |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>HYPERLEDGER FABRIC &amp; ETHEREUM</b> | <b>6 Periods</b> |
| Hyperledger Fabric Architecture: Components (Peers, Orderers, Certificate Authorities) – Chaincode Development and Deployment – Membership Service Provider (MSP) – Channels and Private Data Collections – Transaction Flow and Endorsement Policies – Ethereum Network Overview – Ethereum Virtual Machine (EVM) – Ether and Gas: Concepts and Fee Mechanism – Smart Contract Development using Solidity – Ethereum Tools: Remix IDE, Truffle Suite, and Ganache |                                          |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | BLOCKCHAIN APPLICATIONS | 6 Periods |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------|
| Smart Contracts – Development and Deployment using Truffle Suite – Decentralized Applications (DApps): Architecture and Use Cases – Non-Fungible Tokens (NFTs): Standards and Applications – Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance, Healthcare, and Governance – Case Studies on Real-world Implementations-Decentralized Identity (DID) and Self-Sovereign Identity (SSI) – Integration of Blockchain with Emerging Technologies (AI, IoT, and Cloud) |                         |           |

**TOTAL: 30 Periods****PRACTICAL EXERCISES**

1. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on cloud to run.
2. Create and deploy a blockchain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chain code, and perform invoke and query on your blockchain network.
3. Interact with a blockchain network. Execute transactions and requests against a blockchain network by creating an app to test the network and its rules.
4. Deploy an asset-transfer app using blockchain. Learn app development within a Hyperledger Fabric network.
5. Use blockchain to track fitness club rewards. Build a web app that uses Hyperledger Fabric to track and trace member rewards.
6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Blockchain Starter Plan. Use Hyperledger Fabric to invoke chain code while storing results and data in the starter plan

**TOTAL : 30 Periods****TOTAL : 30+30=60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.</li> <li>2. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, 2014.</li> </ol>                                                                                                         |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Daniel Drescher, "Blockchain Basics", First Edition, Apress, 2017.</li> <li>2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.</li> <li>3. Melanie Swan, "Blockchain: Blueprint for a New Economy", O'Reilly, 2015</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc22_cs44/preview">https://onlinecourses.nptel.ac.in/noc22_cs44/preview</a>                                                                                                                                                                                                                                                                                                |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                      | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the basic abstract models used in Blockchain technology.                                                                  | Understand (K2)      |
| CO2                                                       | Understand how cryptocurrency systems like Bitcoin and Ethereum work in terms of transactions, mining, risks, and performance.       | Understand (K2)      |
| CO3                                                       | Apply smart contract programming and develop simple decentralized applications (dApps) using platforms like Ethereum or Hyperledger. | Apply (K3)           |
| CO4                                                       | Apply tools to develop and deploy smart contracts using Solidity and related frameworks.                                             | Apply (K3)           |
| CO5                                                       | Analyze and design decentralized applications and explain practical blockchain use cases.                                            | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | 2        | 1        | 1        | -        | -        | -        | -        | -        | -        | -         | -         | 3         | 2         | 1         | 3         |
| CO-2        | -        | 3        | 3        | 3        | 1        | -        | -        | -        | -        | -        | -         | -         | 3         | 3         | 2         | -         |
| CO-3        | -        | 3        | 2        | 1        | 1        | -        | -        | -        | -        | -        | -         | -         | 3         | 3         | 3         | -         |
| CO-4        | -        | -        | 3        | 3        | 1        | -        | -        | -        | -        | -        | -         | -         | 3         | 1         | -         | -         |
| CO-5        | -        | 2        | 3        | 1        | 1        | -        | -        | -        | -        | -        | -         | -         | 3         | 2         | 1         | -         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PCS13 - Network Security**

| Prerequisite                | Programme Name                 | Semester | Category | L | T | P | C |
|-----------------------------|--------------------------------|----------|----------|---|---|---|---|
| 23CS501 - Computer Networks | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                                                 |
|----|---------------------------------------------------------------------------------|
| 1. | Understand the basic concepts of security services, mechanisms, and attacks.    |
| 2. | Study and analyze symmetric and asymmetric cryptographic techniques.            |
| 3. | Learn about key distribution, authentication protocols, and digital signatures. |
| 4. | Examine network security practices including firewalls, IDS, and IPsec.         |
| 5. | Explore web and email security measures including SSL/TLS, PGP, and S/MIME.     |

**III - Course Content**

**Preamble:** Network Security focuses on protecting data, devices, and communication across computer networks from threats and attacks. The subject covers cryptographic techniques, authentication, firewalls, intrusion detection, and secure protocols. It emphasizes risk analysis, prevention strategies, and resilience against evolving cyber threats.

|                                                                                                                                                                                                                                                          |                                              |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                          | <b>INTRODUCTION</b>                          | <b>6 Periods</b> |
| Data Communication -Networks – Network Types-Network Topologies-Basics of cryptography-conventional and public-key cryptography- hash functions- authentication- and digital signatures.                                                                 |                                              |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                         | <b>KEY MANAGEMENT AND DISTRIBUTION</b>       | <b>6 Periods</b> |
| Symmetric Key Distribution- Distribution of Public Keys- X.56 Certificates- Public-Key Infrastructure emote User-Authentication Using Symmetric Encryption- Kerberos Systems- Remote User Authentication Using Asymmetric Encryption                     |                                              |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                        | <b>ACCESS CONTROL AND SECURITY</b>           | <b>6 Periods</b> |
| Network Access Control: Network Access Control- Extensible Authentication Protocol- IEEE 802.1X Port-Based Network Access Control - IP Security - Internet Key Exchange (IKE).- Transport Layer Security- HTTPS standard- Secure Shell (SSH) application |                                              |                  |
| <b>UNIT -IV</b>                                                                                                                                                                                                                                          | <b>APPLICATION LAYER SECURITY</b>            | <b>6 Periods</b> |
| Electronic Mail Security: Pretty Good Privacy- S/MIME- DomainKeys Identified Mail. Wireless Network Security: Mobile Device Security                                                                                                                     |                                              |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                          | <b>COMMUNICATION TECHNIQUES AND SECURITY</b> | <b>6 Periods</b> |
| Cellular Internet access – 3G- 4G- 5Gand beyond 6G –IDS-Firewalls-DigitalSignatures– EndPointAuthentication-Futuretechnologies-SDN(Software defined network)- Internet of Everything (IoE)                                                               |                                              |                  |

**TOTAL: 30 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**PRACTICAL EXERCISES:**

1. Implement symmetric key algorithms
2. Implement asymmetric key algorithms and key exchange algorithms
3. Implement digital signature schemes
4. Installation of Wire shark, tcpdump and observe data transferred in client-server communication using UDP/TCP and identify the UDP/TCP datagram.
5. Check message integrity and confidentiality using SSL
6. Experiment Eavesdropping, Dictionary attacks, MITM attacks
7. Demonstrate intrusion detection system using any tool.
8. Explore network monitoring tools

**TOTAL : 30 Periods****TOTAL : 30+30=60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Stallings, W. (2017). Cryptography and network security: Principles and practice (7th ed.). Pearson.</li> <li>2. Katz, J., &amp; Lindell, Y. (2020). Introduction to modern cryptography (3rd ed.). CRC Press.</li> <li>3. Paar, C., &amp; Pelzl, J. (2010). Understanding cryptography: A textbook for students and practitioners. Springer.</li> </ol>                                                                       |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Schneier, B. (1996). Applied cryptography: Protocols, algorithms, and source code in C (2nd ed.). Wiley.</li> <li>2. Singh, S. (1999). The code book: The science of secrecy from ancient Egypt to quantum cryptography. Anchor Books.</li> <li>3. Forouzan, B. A. (2008). Cryptography and network security. McGraw-Hill.</li> <li>4. Mao, W. (2004). Modern cryptography: Theory and practice. Pearson Education.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc25_ee54/preview">https://onlinecourses.nptel.ac.in/noc25_ee54/preview</a>                                                                                                                                                                                                                                                                                                                                                  |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Describe security concepts, services, and mechanisms.              | Understand (K2)      |
| <b>CO2</b>                                                | Understand symmetric and asymmetric encryption techniques.         | Understand (K2)      |
| <b>CO3</b>                                                | Analyze authentication and key management protocols.               | Apply (K3)           |
| <b>CO4</b>                                                | Illustrate secure communication practices in networks and the web. | Apply (K3)           |
| <b>CO5</b>                                                | Analyze cryptographic techniques in simulated environments.        | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | 3        | -        | 2        | -        | -        | -        | -        | -        | -        | -         | -         | 2         | -         | -         | 3         |
| CO-2        | 3        | 3        | 2        | -        | -        | -        | -        | -        | -        | -        | -         | -         | 3         | -         | -         | 3         |
| CO-3        | 3        | 3        | 3        | 3        | 2        | -        | -        | -        | -        | -        | -         | -         | 3         | 2         | -         | 3         |
| CO-4        | 3        | 3        | 2        |          | 2        | -        | -        | -        | -        | -        | -         | -         | 3         | 2         | -         | 3         |
| CO-5        | 3        | 3        |          | 2        | 3        | -        | -        | -        | -        | -        | -         | -         | 3         | 3         | 2         | 3         |

Mapping:1-Low- 2-Medium- 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23PCS14 - Augmented Reality/Virtual Reality**

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                                                     |
|----|-------------------------------------------------------------------------------------|
| 1. | To understand the fundamental concepts of AR/VR technologies.                       |
| 2. | To explore various tools and techniques used in developing AR/VR applications.      |
| 3. | To study the modeling and simulation techniques in AR/VR environments.              |
| 4. | To understand the interaction methods and hardware used in immersive systems.       |
| 5. | To analyze application domains, ethical challenges, and future directions in AR/VR. |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                  |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------|
| <b>Preamble:</b> This course introduces the fundamentals of Virtual Reality (VR) and Augmented Reality (AR), covering the concepts of immersive technologies, hardware/software systems, modeling and simulation, toolkits, and application domains including healthcare, education, military, and entertainment.                                                                                                                                                                                                                                                                                      |                                                  |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Fundamentals of AR/VR</b>                     | <b>6 Periods</b> |
| Introduction to Virtual Reality and Augmented Reality – Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System- Introduction to Immersive Technologies (AR, VR, MR, XR)- – Graphics Display -3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System - Applications of AR/VR |                                                  |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>3D Object Modeling and Simulation in VR</b>   | <b>6 Periods</b> |
| Geometric Modeling- Virtual Object Shape- Kinematics Modeling- Transformation Matrices- Development Basics of 3D Graphics and Game Engines- Development Basics of 3D Graphics and Game Engines- Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping                                                                                                                                                                                                                                            |                                                  |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>VR Toolkits and AR Interaction Techniques</b> | <b>6 Periods</b> |
| VR Programming – Toolkits and Scene Graphs – World Tool Kit – Java 3D – Comparison of World Tool Kit and Java 3D-Augmented Reality Introduction to Augmented Reality-Computer vision for AR-Interaction-Modeling and Annotation Navigation-Wearable devices.                                                                                                                                                                                                                                                                                                                                           |                                                  |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Case Studies and Emerging Trends</b>          | <b>6 Periods</b> |
| Analysis of successful AR/VR applications in gaming, education, healthcare, and retail-Discussion on ethical considerations and challenges in AR/VR-Future directions and research opportunities in AR/VR                                                                                                                                                                                                                                                                                                                                                                                              |                                                  |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Applications</b>                              | <b>6 Periods</b> |
| Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education.                                                                                                                                                                                                                     |                                                  |                  |

**TOTAL: 30 Periods**

**PRACTICAL EXERCISES:**

1. Study of tools like Unity, Maya, 3DS MAX, AR toolkit, Vuforia and Blender.
2. Use the primitive objects and apply various projection types by handling camera.
3. Download objects from asset store and apply various lighting and shading effects.
4. Model three dimensional objects using various modeling techniques and apply textures over them.
5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity.
6. Add audio and text special effects to the developed application.
7. Develop VR enabled applications using motion trackers and sensors incorporating full haptic interactivity.
8. Develop AR enabled applications with interactivity like E learning environment, Virtual walkthroughs and visualization of historic places.
9. Develop AR enabled simple applications like human anatomy visualization, DNA/RNA structure visualization and surgery simulation.
10. Develop simple MR enabled gaming applications.

**TOTAL : 30 Periods****TOTAL : 30 + 30 = 60 Periods**

|                            |                                                                                                                                                                                               |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Alan B. Craig, Understanding Augmented Reality: Concepts and Applications, Morgan Kaufmann.<br>2. Grigore C. Burdea and Philippe Coiffet, Virtual Reality Technology, Wiley-IEEE Press.    |
| <b>Reference Books:</b>    | 1. Dieter Schmalstieg and Tobias Hollerer, Augmented Reality: Principles and Practice, Addison-Wesley.<br>2. Jason Jerald, The VR Book: Human-Centered Design for Virtual Reality; ACM Books. |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc25_cs87/">https://onlinecourses.nptel.ac.in/noc25_cs87/</a> preview                                                                             |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the basic concepts of AR and VR                    | Understand (K2)      |
| <b>CO2</b>                                                | Understand the tools and technologies related to AR/VR        | Understand (K2)      |
| <b>CO3</b>                                                | Explain the working principle of AR/VR related Sensor devices | Understand (K2)      |
| <b>CO4</b>                                                | Design of various models using modeling techniques            | Apply (K3)           |
| <b>CO5</b>                                                | Analyze the basic concepts of AR and VR                       | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | 2        | —        | —        | 3        | —        | —        | —        | —        | —         | —         | —         | 3         | —         | —         |
| CO-2        | 3        | 3        | 2        | —        | 3        | —        | —        | —        | —        | —         | —         | —         | 3         | 2         | —         |
| CO-3        | 3        | 2        | 2        | 2        | 3        | —        | —        | —        | —        | —         | —         | —         | 2         | 3         | —         |
| CO-4        | 3        | 2        | 3        | 2        | 3        | —        | —        | —        | —        | —         | —         | —         | 3         | 2         | 2         |
| CO-5        | 3        | 3        | 3        | 2        | 3        | 2        | —        | —        | 2        | 2         | —         | 2         | 3         | 3         | 3         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PCS15 - Multimedia and Animation**

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                                                                                                                                                         |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Introduce the fundamental components of multimedia systems such as text, images, audio, video, and animation, along with their formats and real-world applications                      |
| 2. | Provide foundational knowledge of 2D and 3D computer graphics, including raster/vector graphics, basic drawing algorithms, transformations, projections, and color models               |
| 3. | Explain key animation principles and demonstrate techniques used in 2D and 3D environments including frame-by-frame animation, tweening, rigging, and key framing                       |
| 4. | Familiarize students with multimedia authoring tools and scripting languages for integrating and developing interactive multimedia content                                              |
| 5. | Expose students to emerging trends such as Virtual Reality (VR), Augmented Reality (AR), visual effects (VFX), and their applications in gaming, advertising, and e-learning industries |

**III - Course Content**

**Preamble:** Multimedia and Animation combine text, graphics, audio, video, and interactivity to create engaging digital content. This subject introduces fundamental concepts of multimedia systems, animation techniques, and design principles. It enables students to develop creative skills for producing interactive applications, games, and visual effects. The course bridges technology and creativity, preparing learners for careers in digital media and entertainment industries.

|                                                                                                                                                                                                                                                                                                         |                                               |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                         | <b>Introduction to Multimedia Systems</b>     | <b>6 Periods</b> |
| Components of multimedia: Text, images, audio, video, animation Multimedia system architecture<br>Multimedia applications: e-learning, entertainment, advertising File formats and standards (MPEG, MP3, JPEG, PNG, MP4, GIF) Overview of multimedia authoring tools and platforms                      |                                               |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                        | <b>Computer Graphics Fundamentals</b>         | <b>6 Periods</b> |
| Raster vs vector graphics 2D graphics: Line/circle drawing (DDA, Bresenham), transformations, clipping 3D graphics basics: Modeling, transformations (translation, scaling, rotation), projections Color theory: RGB, HSV, CMYK Basics of image processing (filtering, noise removal, histogram)        |                                               |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                       | <b>Principles and Techniques of Animation</b> | <b>6 Periods</b> |
| 12 Principles of Animation (e.g., squash and stretch, anticipation, timing) 2D Animation: Frame-by-frame, tweening, morphing 3D Animation: Modeling, rigging, skinning, key framing Stop motion and experimental animation Case studies of animation in cinema, gaming, and mobile apps                 |                                               |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                        | <b>Multimedia Authoring and Scripting</b>     | <b>6 Periods</b> |
| Timeline and scripting-based authoring models Tools: Adobe Animate, Flash, Unity basics for animation Integration of text, audio, video, animation in interactive applications Multimedia project design: User interface, interactivity, usability Basics of Action Script/JavaScript for interactivity |                                               |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

| Unit – V                                                                                                                                                                                                                                                                                          | Emerging Trends and Industry Practice | 6 Periods |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------|
| Visual effects (VFX): Compositing, Roto scoping, Chroma keying Virtual Reality (VR) and Augmented Reality (AR) in multimedia Game design principles and interactive storytelling Portfolio building and demo reel preparation Case studies of multimedia projects in advertising, gaming, ed-tech |                                       |           |

**TOTAL: 30 Periods****PRACTICAL EXERCISES:**

1. 2D & 3D animation mini-projects using Blender, Maya or Pencil2D
2. Interactive multimedia application using authoring tools
3. Image and video processing exercises using Python/OpenCV
4. VFX compositing using After Effects or DaVinci Resolve
5. Final project: Build a multimedia story/game/interactive app

**TOTAL : 30 Periods****TOTAL : 30 +30 = 60 Periods**

|                            |                                                                                                                                                       |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, "Fundamentals of Multimedia", Third Edition, Springer Texts in Computer Science, 2021. (UNIT-I, II, III) |
| <b>Reference Books:</b>    | 1. Gerald Friedland, Ramesh Jain, "Multimedia Computing", Cambridge University Press, 2018                                                            |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/117105083">https://nptel.ac.in/courses/117105083</a>                                                             |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the components of multimedia systems and their real-world applications.                           | Understand (K3)      |
| <b>CO2</b>                                                | Apply basic computer graphics techniques for 2D and 3D multimedia content creation                           | Apply (K3)           |
| <b>CO3</b>                                                | Demonstrate animation principles and techniques in both 2D and 3D environment                                | Apply (k3)           |
| <b>CO4</b>                                                | Use multimedia authoring tools and scripting to create interactive multimedia content                        | Analyze (k4)         |
| <b>CO5</b>                                                | Analyze emerging trends such as AR/VR and visual effects and apply industry practices in project development | Analyze (k4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 2        | -        | -        | -        | 2        | -        | -        | -        | -        | -        | -         | -         | 3         | -         | -         | -         |
| CO-2        | 3        | 2        | 3        | -        | 3        | -        | -        | -        | -        | -        | -         | -         | 3         | 2         | -         | 2         |
| CO-3        | 3        | 2        | 3        | -        | 2        | -        | -        | -        | 2        | -        | -         | -         | 3         | 3         | 2         | 2         |
| CO-4        | 2        | 2        | 3        | 2        | 3        | -        | -        | -        | 2        | 2        | -         | -         | 3         | 3         | 2         | 2         |
| CO-5        | 2        | 3        | 3        | 3        | 3        | 2        | 2        | 1        | 2        | 2        | 1         | 2         | 3         | 3         | 3         | 3         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PCS16 - Video Creation and Editing**

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                                               |
|----|-------------------------------------------------------------------------------|
| 1. | Understand the Fundamentals and Evolution of Filmmaking                       |
| 2. | Analyze the Impact of Editing on Storytelling                                 |
| 3. | Gain Technical Knowledge of Digital Editing Tools and Processes               |
| 4. | Learn and Apply Digital Storytelling Techniques                               |
| 5. | Understand the Science of Lightning Transients (Cross-disciplinary Knowledge) |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|
| <b>Preamble:</b> Video Creation and Editing focuses on the fundamentals of capturing, producing, and refining digital video content. The subject introduces techniques in shooting, editing, transitions, effects, and audio integration. It enhances creative and technical skills using professional editing tools and work flows. Students gain the ability to produce high-quality videos for media, education, and industry applications. |                                        |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Fundamentals of Filmmaking</b>      | <b>6 Periods</b> |
| Fundamentals Evolution of filmmaking – linear editing – non-linear digital video -colour images– Economy of Expression – risks associated with altering reality through editing                                                                                                                                                                                                                                                                |                                        |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Storytelling in the Digital Age</b> | <b>6 Periods</b> |
| Zero-crossings of the second derivative; Scale in image processing-Storytelling styles in a digital world through jump cuts, L-cuts, match cuts, cutaways, dissolves, split edits – Consumer and pro NLE systems – digitizing images – managing resolutions -mechanics of digital editing – pointer files – media management                                                                                                                   |                                        |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Lightning Transients</b>            | <b>6 Periods</b> |
| Theories of cloud formation - mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke - factors contributing to good line design - protection using ground wires - tower footing resistance - Interaction between lightning and power system.                                                                                                                                                  |                                        |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Working with Final Cut Pro</b>      | <b>6 Periods</b> |
| Working with clips and the Viewer – working with sequences, the Timeline, and the canvas – Basic Editing – Adding and Editing Testing Effects – Advanced Editing and Training Techniques – Working with Audio – Using Media Tools – Viewing and Setting Preferences.                                                                                                                                                                           |                                        |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Working With Avid Xpress Dv 4</b>   | <b>6 Periods</b> |
| Starting Projects and Working with Project Window – FaceNet for Face Recognition- Using Basic Tools and Logging – Preparing to Record and Recording – Importing Files – Organizing with Bins – Viewing and Making Footage -Using Timeline and Working in Trim Mode – Working with Audio – Output Options.                                                                                                                                      |                                        |                  |

**TOTAL: 30 Periods**

**PRACTICAL EXERCISES:**

1. Write a Movie Synopsis (Individual/Team Writing)
2. Present team stories in class.
3. Script/Storyboard Writing (Individual Assignment)
4. Pre-Production: Personnel, budgeting, scheduling, location scouting, casting, contracts & agreements
5. Production: Single camera production personnel & equipment, Documentary Production
6. Writing The Final Proposal: Overview, Media Treatments, Summary, Pitching
7. Write Documentary & Animation Treatment
8. Post-production: Editing, Sound design, Finishing

**TOTAL : 30 Periods****TOTAL : 30 + 30 = 60 Peri**

|                            |                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Avid Xpress DV 4 User Guide, 2007.<br>2. Final Cut Pro 6 User Manual, 2004.<br>3. Keith Underdahl, "Digital Video for Dummies", Third Edition, Dummy Series, 2001. |
| <b>Reference Books:</b>    | 1. Robert M. Goodman and Partick McGarth, "Editing Digital Video: The Complete Creative and Technical Guide", Digital Video and Audio, McGraw – Hill 2003.            |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.swayam2.ac.in/cec21_ge17/preview">https://onlinecourses.swayam2.ac.in/cec21_ge17/preview</a>                                           |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the evolution of filmmaking and differentiate between linear and non-linear editing techniques | Understand (K2)      |
| <b>CO2</b>                                                | Describe the impact of editing techniques (e.g., jump cuts, L-cuts) on storytelling in digital media   | Understand (K2)      |
| <b>CO3</b>                                                | Apply digital editing tools and processes including media management and resolution handling.          | Apply (K3)           |
| <b>CO4</b>                                                | Analyze the proficiency in using Final Cut Pro and Avid Xpress DV 4 for editing video projects         | Analyze (K4)         |
| <b>CO5</b>                                                | Analyze the risks associated with altering reality through editing and propose ethical solutions.      | Analyze (K4)         |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO-1</b> | 2    | 1    | -    | -    | 2    | -    | -    | -    | 1    | -    | -     | -     | 3     | -     | 2     | 1     |
| <b>CO-2</b> | -    | 3    | 2    | -    | 3    | -    | -    | -    | -    | 1    | -     | -     | 3     | 2     | -     | 3     |
| <b>CO-3</b> | -    | 2    | 3    | 1    | 3    | -    | -    | -    | 1    | -    | -     | -     | 3     | 3     | -     | 2     |
| <b>CO-4</b> | -    | -    | 3    | 2    | 3    | -    | -    | -    | 2    | 1    | -     | -     | 3     | 3     | -     | -     |
| <b>CO-5</b> | 2    | 3    | -    | -    | 2    | 3    | 2    | -    | 1    | -    | -     | -     | 2     | -     | 2     | 3     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

## I - Course Name: 23PCS17 - Digital Marketing

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                            |
|----|----------------------------------------------------------------------------|
| 1. | Understand the fundamentals of digital marketing and its ecosystem.        |
| 2. | Gain knowledge of tools used for website creation and content marketing.   |
| 3. | Learn about SEO, SEM, and how to optimize online presence.                 |
| 4. | Explore effective techniques in email, mobile, and social media marketing. |
| 5. | Analyze campaign performance using digital analytics tools.                |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                      |                                               |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------|
| <b>Preamble:</b> This course introduces students to core digital marketing strategies and tools. It emphasizes practical exposure through real-time assignments to design, optimize, and analyze digital campaigns across multiple platforms.                                                                        |                                               |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                      | <b>Introduction</b>                           | <b>6 Periods</b> |
| Introduction to Online Market- Online Market Space fundamentals- Digital Marketing Strategy & Components- Website Planning and Creation with tools (e.g., Wix, Word Press)- Introduction to Content Marketing using blogs, info graphics-Real-time: Design and launch a basic website project with branding elements |                                               |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                     | <b>Search Engine Optimization</b>             | <b>6 Periods</b> |
| Keyword Research using Google Keyword Planner-On-page SEO: Meta tags, Headings, URL structure-Off-page SEO: Back linking, Directory submission-SEM: PPC campaigns using Google Ads- Real-time: Run a live SEO audit and Google Ads campaign                                                                          |                                               |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                    | <b>Email &amp; Mobile Marketing</b>           | <b>6 Periods</b> |
| Designing Email Campaigns with Mail chimp or Send in blue- Email Automation and Analytic-Mobile Marketing: SMS campaigns, App-based Ads- Real-time: Launch an email series + set up SMS alert promotions                                                                                                             |                                               |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                     | <b>Social Media Marketing (SMM)</b>           | <b>6 Periods</b> |
| Use of platforms: Facebook, Instagram, LinkedIn, Twitter- Creating and managing brand pages- Influencer collaboration strategies- Real-time: Run a 5-day paid campaign on Meta Ads (Facebook/Instagram) and measure engagement                                                                                       |                                               |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                      | <b>Digital Transformation &amp; Analytics</b> | <b>6 Periods</b> |
| Google Analytics for Web & Campaign tracking- ROI measurement of campaigns- Integrating multiple channels (Email, Mobile, Web)- Real-time: Prepare and present a Digital Performance Report based on simulated campaign data                                                                                         |                                               |                  |

**TOTAL: 30 Periods**



**LIST OF EXPERIMENTS:**

1. Website Creation and Optimization
2. Search Engine Optimization (SEO) Basics
3. Search Engine Marketing (SEM) – Google Ads
4. Social Media Marketing (SMM)
5. Email Marketing
6. Content Marketing & Blogging
7. Web Analytics (Google Analytics / Matomo)
8. Affiliate Marketing & Influencer Marketing
9. Video Marketing (YouTube/Instagram Reels)
10. Online Reputation Management (ORM)
11. E-Commerce and Digital Payments
12. Case Study & Campaign Performance Analysis

**TOTAL : 30 Periods****TOTAL : 30+30=60 Periods**

|                            |                                                                                                                                                                                                                      |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Digital Marketing: Strategy, Implementation and Practice, Pearson, Latest Edition.<br>2. Seema Gupta, Digital Marketing, McGraw Hill Education, Latest Edition. |
| <b>Reference Books:</b>    | 1. Dave Chaffey, Fiona Ellis-Chadwick, Digital Marketing, Pearson Education.<br>2. Ryan Deiss and Russ Henneberry, Digital Marketing for Dummies, Wiley.<br>3. Debra Zahay, Digital Marketing Management, Routledge. |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/imb25_mg31/preview">https://onlinecourses.nptel.ac.in/imb25_mg31/preview</a>                                                                                              |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                     | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the fundamentals and strategies of digital marketing.                       | Understand (K2)      |
| <b>CO2</b>                                                | Design and develop a website with content marketing tools.                          | Apply (K3)           |
| <b>CO3</b>                                                | Implement SEO, SEM, email, and mobile marketing strategies.                         | Apply (K3)           |
| <b>CO4</b>                                                | Manage social media campaigns and measure engagement metrics.                       | Analyze (K4)         |
| <b>CO5</b>                                                | Analyze the effectiveness of digital campaigns using analytics and reporting tools. | Analyze (K4)         |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>CO-1</b> | 3        | 2        | 1        | 1        | 2        | 1        | 1        | -        | 2        | 2         | -         | 1         | 2         | -         | -         |
| <b>CO-2</b> | 2        | 2        | 3        | 2        | 3        | 1        | 1        | -        | 2        | 3         | -         | 2         | 3         | 1         | -         |
| <b>CO-3</b> | 3        | 3        | 3        | 2        | 3        | 2        | -        | -        | 2        | 2         | -         | 2         | 3         | 2         | -         |
| <b>CO-4</b> | 2        | 2        | 2        | 3        | 3        | 1        | -        | -        | 3        | 2         | -         | 2         | 3         | 2         | -         |
| <b>CO-5</b> | 2        | 3        | 3        | 3        | 3        | 2        | -        | -        | 3        | 3         | -         | 3         | 3         | 3         | -         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



## I - Course Name: 23PCS18 - Visual Effects

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                                                               |
|----|---------------------------------------------------------------------------------------------------------------|
| 1. | Apply principles and techniques of 2D/3D animation and motion graphics.                                       |
| 2. | Implement CGI workflows, color grading, lighting, and rendering in VFX.                                       |
| 3. | Create special effects and particle systems using graphics programming and tools.                             |
| 4. | Execute camera tracking, motion capture, and advanced compositing techniques.                                 |
| 5. | Perform professional post-production tasks including video editing, audio mixing, and VR/AR content creation. |

## III - Course Content

**Preamble:** Visual Effects (VFX) explores techniques for creating realistic and imaginative visuals using digital tools. The subject introduces compositing, motion graphics, 3D effects, and simulation methods. It develops creativity and technical expertise in enhancing film, animation, and multimedia content. Students acquire skills to design professional visual effects for entertainment and industry applications.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                          |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>ANIMATION BASICS AND INTRODUCTION TO VISUAL EFFECTS</b>               | <b>6 Periods</b> |
| VFX Production Pipeline and Workflow-Principles of Animation (Squash & Stretch, Anticipation, Timing)- Animation Techniques: Key frame, Kinematics, Rotoscoping, Stop Motion, Pixilation-Rigging, Shape Keys, Motion Paths-Basics of Computer Graphics and GUI-Display Devices and Input Systems-Introduction to Graphics Algorithms: Bresenham's Line, DDA, Circle Drawing-Overview of Animation Software: Blender, Adobe Animate                                                     |                                                                          |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>CGI, COLOR, LIGHT, AND GEOMETRIC TRANSFORMATIONS</b>                  | <b>6 Periods</b> |
| CGI Concepts: Virtual Worlds, Photorealism, Physical and Functional Realism-3D Modeling & Rendering Pipeline- Color Theory Color Spaces (RGB, HSV, CMYK), Color Grading, HDRI-Lighting Techniques: Area, Mesh, Image-based, Photometric, PBR Lights-Affine Transformations in 2D and 3D (Translation, Rotation, Scaling, Shearing) Camera Models and Viewing Pipelines (Perspective, Orthographic, Isometric)-Scan Conversion, Clipping, and Solid Modeling (Wireframe, Octrees, CSG)- |                                                                          |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>SPECIAL EFFECTS, GRAPHICS PROGRAMMING &amp; MULTIMEDIA COMPONENTS</b> | <b>6 Periods</b> |
| Special Effects: Particle Systems (Wind, Rain, Fire, Smoke), Schufftan Process-OpenGL Primitives & Pipeline for 2D/3D Graphics-Hidden Surface Removal Techniques: Z-buffer, Painter's Algorithm, BSP Trees-Multimedia Components: Text, Image, Audio, Video, Animation Integration-Audio Fundamentals: Formats, Channels, Mixing Basics Introduction to Multimedia Authoring Tools                                                                                                     |                                                                          |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Periods</b>                                                           | <b>6 Periods</b> |
| Motion Capture Technologies and Pipeline-Matte Painting, Match -Moving, Rotoscoping, Planar Tracking Camera Reconstruction and Calibration Techniques-Shading Models: Phong, Gouraud, Shadows-Curves and Surfaces: Bezier, B-Splines, NURBS Introduction to VR/AR: Unity Basics, Creating Virtual Environments, 360° Video, Immersive Experiences Image-Based Rendering, Depth of Field, Image Morphing                                                                                |                                                                          |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>COMPOSITING, POST-PRODUCTION &amp; EMERGING TRENDS</b>                | <b>6 Periods</b> |
| Compositing Techniques: Chroma Keying, Alpha Compositing, Deep Image Compositing VFX Tools: Blender, Natron, GIMP, Adobe After Effects Video Editing and Formats: Adobe Premiere Pro, Final Cut Pro X Audio Editing: Adobe Audition, Multi-track Mixing Advanced Texture Mapping: Bump, Displacement,                                                                                                                                                                                  |                                                                          |                  |

Environmental Maps, Procedural Noise Animation Types: Soft Object Modeling, Soft Body Simulation  
Emerging Trends: Image Stitching/Mosaics, Novel View Synthesis, Immersive VR Content Production

TOTAL: 30 Peri

**PRACTICAL EXERCISES:**

1. Animation Fundamentals and Keyframe Practice
2. 2D/3D Geometric Transformations and Rendering
3. Color Theory and Lighting Experiment
4. Particle Systems and Special Effects Simulation
5. Rotoscoping, Matte Painting, and Match-Moving
6. Compositing and Chroma Keying
7. Soft Body Simulation and Texture Mapping
8. VR/AR Environment and Immersive Content Creation

TOTAL :30 Periods

TOTAL : 30+30=60 Periods

|                            |                                                                                                                                                                                                                                                                                                                         |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Chris Roda, Real Time Visual Effects for the Technical Artist, CRC Press, 1st Edition, 2022.<br>2. Steve Wright, Digital Compositing for film and video, Routledge, 4th Edition, 2017.                                                                                                                               |
| <b>Reference Books:</b>    | 1. Jon Gress, <i>Digital Visual Effects and Compositing</i> , New Riders Press, 2014<br>Jasmine Katatikarn, Michael Tanzillo, <i>Lighting for Animation: The Art of Visual Storytelling</i> , Routledge, 2016<br>2. Foley, van Dam, Feiner, and Hughes, <i>Computer Graphics: Principles and Practice</i> , 3rd Edition |
| <b>MOOC/Web Platforms:</b> | Coursera – <a href="http://www.coursera.org">www.coursera.org</a>                                                                                                                                                                                                                                                       |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the principles of 2D/3D animation and motion graphics using industry-standard tools | Understand (K3)      |
| <b>CO2</b>                                                | Analyze CGI workflows including modeling, rendering, lighting, and color grading techniques    | Analyze (K4)         |
| <b>CO3</b>                                                | Apply special effects using graphics programming and particle systems                          | Apply (K3)           |
| <b>CO4</b>                                                | Analyze and execute VFX techniques like camera tracking, motion capture, and compositing       | Analyze (K4)         |
| <b>CO5</b>                                                | Perform post-production tasks including video/audio editing and immersive content creation     | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | -        | 2        | -        | 3        | -        | -        | -        | -        | 2        | -         | -         | 3         | -         | 3         | -         |
| CO-2        | 3        | -        | 3        | -        | 3        | -        | -        | -        | -        | 2        | -         | -         | 3         | 2         | 3         | -         |
| CO-3        | 3        | 2        | 3        | 2        | 3        | -        | -        | -        | -        | 2        | -         | -         | 3         | 3         | 3         | 2         |
| CO-4        | 3        | 3        | 3        | 3        | 3        | -        | -        | -        | -        | 2        | -         | -         | 3         | 3         | 3         | 3         |
| CO-5        | 3        | -        | 3        | -        | 3        | -        | -        | -        | 2        | 3        | -         | -         | 3         | 3         | 3         | -         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PCS19 - Game Development**

| Prerequisite | Programme Name                 | Semester | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                            |
|----|--------------------------------------------|
| 1. | Explain the concepts of 2D and 3d Graphics |
| 2. | Design game design documents.              |
| 3. | Implementation of gaming engines.          |
| 4. | Survey gaming environments and frameworks  |
| 5. | Implement a simple game in Pygame          |

**III - Course Content**

**Preamble:** This course introduces the foundations of 2D and 3D graphics, game design principles, and interactive storytelling for developing engaging digital games. It equips students with skills in game engine architecture, rendering techniques, collision detection, and AI-driven gameplay mechanics.

|                                                                                                                                                                                                                                                                                                                                                               |                                                             |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                               | <b>Fundamentals of 3D Graphics in Game Development</b>      | <b>6 Periods</b> |
| Introduction to 2D and 3D graphics, including avatars and game components - Understanding 2D and 3D transformations - Study of different projection techniques in graphics -Analysis of color models used in game graphics - Basics of lighting and shader models- Controller-based animation methods                                                         |                                                             |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                              | <b>Core Concepts and Strategies in Game Design</b>          | <b>6 Periods</b> |
| Creating compelling game characters - Developing storyboards for games -Designing and narrating game scripts -Ensuring fair and engaging gameplay- Understanding fundamental game mechanics - Principles of designing game levels - Writing for preproduction, production, and post-production phases                                                         |                                                             |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                             | <b>Architecture and Development of Game Engines</b>         | <b>6 Periods</b> |
| Understanding rendering techniques- Differences between software and hardware rendering - Techniques for efficient rendering - Algorithms used in game engines- Methods for detecting collisions in games - Implementing game rules and logic - Basics of game AI and path finding.                                                                           |                                                             |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                              | <b>Introduction to Game Development Platforms and Tools</b> | <b>6 Periods</b> |
| Introduction to game development using Pygame - Exploring Unity for game development - Writing scripts in Unity - Developing games for mobile platforms - Utilizing Game Studio for game development - Creating single-player and multiplayer games                                                                                                           |                                                             |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                               | <b>Building Games with Pygame</b>                           | <b>6 Periods</b> |
| Install and explore Unity or Unreal Engine - Create and animate game characters - Design game levels and environments - Develop a 2D game using Pygame- Create a puzzle game - Design and implement menus for mobile games - 3D Game Development: Develop a 3D game using Unreal Engine - Multiplayer Game Development: Create a multiplayer game using Unity |                                                             |                  |

**TOTAL: 30 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**PRACTICAL EXERCISES:**

1. Implementing Advanced Character Animations
2. Developing AI-Driven NPCs.
3. Creating Dynamic Weather Systems
4. Implementing Day-Night Cycles
5. Designing Procedural Level Generation
6. Integrating Multiplayer Networking.
7. Implementing Augmented Reality (AR) Features
8. Optimizing Game Performance
9. Conducting User Experience (UX) Testing
10. Developing Cross-Platform Games

**TOTAL : 30 Periods****TOTAL : 30+30=60 Periods**

|                            |                                                                                                                                                                                                                                                                                                 |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Sanjay Madhav, "Game Programming Algorithms and Techniques: A Platform Agnostic Approach", Addison Wesley, 2013.</li> <li>2. Will McGugan, "Beginning Game Development with Python and Pygame: From Novice to Professional", Apress, 2007.</li> </ol> |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Paul Craven, "Python Arcade games", Apress Publishers, 2016.</li> <li>2. David H. Eberly, "3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics", Second Edition, CRC Press, 2006.</li> </ol>                                   |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc24_cs109/preview">https://onlinecourses.nptel.ac.in/noc24_cs109/preview</a>                                                                                                                                                                       |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                             | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the concepts of 2D and 3D graphics in game development                              | Understand (K2)      |
| <b>CO2</b>                                                | Design detailed game design documents including characters, storyboards, and game scripts.  | Apply (K3)           |
| <b>CO3</b>                                                | Design game engine architecture and rendering techniques                                    | Apply (K3)           |
| <b>CO4</b>                                                | Apply various game development platforms and tools such as Pygame, Unity, and Unreal Engine | Apply (K3)           |
| <b>CO5</b>                                                | Analyze a simple 2D game using Pygame and create interactive game features                  | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | –        | –        | –        | 2        | –        | –        | –        | –        | –        | –         | –         | 3         | –         | 3         | –         |
| CO-2        | 2        | 2        | 3        | –        | 2        | –        | –        | –        | 1        | 2        | –         | –         | 3         | 3         | 2         | 2         |
| CO-3        | 3        | 2        | 3        | 2        | 3        | –        | –        | –        | –        | –        | 1         | –         | 3         | 3         | 3         | 2         |
| CO-4        | 2        | 2        | 2        | 2        | 3        | –        | –        | –        | –        | 2        | –         | –         | 2         | 3         | 2         | 2         |
| CO-5        | 3        | 2        | 3        | 2        | 3        | –        | –        | –        | –        | 2        | 1         | 1         | 3         | 3         | 3         | 2         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PCS20 - Multimedia Data Compression and Storage**

| Prerequisite | Programme Name                          | Semester | Category | L | T | P | C |
|--------------|-----------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E / B.Tech - Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                                                         |
|----|-----------------------------------------------------------------------------------------|
| 1. | To introduce the fundamental concepts of data compression techniques                    |
| 2. | To explain various image and video compression standards                                |
| 3. | To understand the architecture and models of multimedia data storage                    |
| 4. | To learn disk scheduling techniques for efficient data retrieval                        |
| 5. | To explore real-time libraries and platforms used in multimedia compression and storage |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                    |                                   |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------|
| <b>Preamble:</b> This course focuses on understanding, applying, and analyzing techniques for compressing and storing multimedia data. It includes hands-on exposure to real-time tools and platforms used in industry for compressing text, images, videos, and managing data on storage systems. |                                   |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                    | <b>Basics of Data Compression</b> | <b>6 Periods</b> |
| Introduction- Lossless and Lossy Compression- Huffman coding- Arithmetic coding- Dictionary techniques- Context-based compression- Applications-Explore open-source compression libraries (e.g., Zlib, Brotli) Case study: Compression in mobile messaging apps                                    |                                   |                  |
| <b>Unit II</b>                                                                                                                                                                                                                                                                                     | <b>Image Compression</b>          | <b>6 Periods</b> |
| JPEG, CALIC, JPEG-LS- Prediction using conditional averages- Progressive transmission- Lossless formats- Applications- Facsimile encoding-Real-time image compression with OpenCV                                                                                                                  |                                   |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                  | <b>Video Compression</b>          | <b>6 Periods</b> |
| Motion compensation- Video signal representation- Standards: H.261, MPEG-1, MPEG-2, H.263-Case study: YouTube or Netflix video encoding                                                                                                                                                            |                                   |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                   | <b>Data Placement on Disks</b>    | <b>6 Periods</b> |
| Statistical/constraint-based allocation- Striping, Replication- Tertiary storage- Hierarchical storage system- Research AWS Glacier and multi-tiered storage                                                                                                                                       |                                   |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                    | <b>Disk Scheduling Methods</b>    | <b>6 Periods</b> |
| Scheduling algorithms for disk requests- Feasibility of concurrent streams- Request stream management- Analyze SSD vs HDD behavior in scheduling                                                                                                                                                   |                                   |                  |

**TOTAL: 30 Periods****PRACTICAL EXERCISES:**

1. Implement image compression using JPEG algorithm
2. Audio compression using Huffman Coding
3. Implement Run-Length Encoding (RLE)
4. Video compression using Motion Estimation
5. LZW Compression on text/image data
6. Discrete Cosine Transform (DCT) on images
7. Wavelet Transform-based image compression
8. Comparative study: Lossy vs Lossless

9. Implement MPEG Encoder basics
10. Mini Project: Build a multimedia compressor

TOTAL : 30 Periods

TOTAL : 30+30=60 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Khalid Sayood, Introduction to Data Compression, 5th Edition, Morgan Kaufmann Publishers, 2017.</li> <li>2. David Salomon, Data Compression: The Complete Reference, Springer, 4th Edition, 2007.</li> </ol>                                                                                                                                   |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Ze-Nian Li, Mark S. Drew, <i>Fundamentals of Multimedia</i>, Pearson Education, 2nd Edition, 2014.</li> <li>2. Toby Berger, <i>Rate Distortion Theory: A Mathematical Basis for Data Compression</i>, Prentice Hall.</li> <li>3. Rafael C. Gonzalez, Richard E. Woods, <i>Digital Image Processing</i>, Pearson, 4th Edition, 2018.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/117105083">https://nptel.ac.in/courses/117105083</a>                                                                                                                                                                                                                                                                                                |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the basics of text, image, and video compression            | Understand (K2)      |
| <b>CO2</b>                                                | Apply and evaluate various multimedia compression algorithms.          | Apply (K3)           |
| <b>CO3</b>                                                | Explore and implement video compression techniques and applications.   | Apply (K3)           |
| <b>CO4</b>                                                | Analyze multimedia storage systems and placement strategies.           | Analyze (K4)         |
| <b>CO5</b>                                                | Analyze and simulate scheduling methods for multimedia data retrieval. | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO-1</b> | 3    | 2    | -    | -    | 2    | 1    | -    | -    | -    | 1     | -     | 1     | 3     | 2     | -     |
| <b>CO-2</b> | 3    | 3    | 3    | 2    | 3    | 2    | -    | -    | 2    | 2     | -     | 2     | 3     | 2     | -     |
| <b>CO-3</b> | 3    | 3    | 3    | 2    | 2    | 2    | -    | -    | 2    | 1     | -     | 2     | 3     | 3     | -     |
| <b>CO-4</b> | 2    | 2    | 2    | 1    | 2    | 1    | -    | -    | 2    | 1     | -     | 2     | 2     | 2     | -     |
| <b>CO-5</b> | 3    | 3    | 2    | 3    | 3    | 2    | -    | -    | 2    | 2     | -     | 3     | 3     | 3     | -     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

## I - Course Name: 23CS906 - ROBOTIC PROCESS AUTOMATION

| Prerequisite | Program Name                            | Sem | Category | L | T | P | C |
|--------------|-----------------------------------------|-----|----------|---|---|---|---|
| NIL          | B.E / B.Tech - Common to CSE, IT, AI&DS | IV  | PCC      | 2 | 0 | 2 | 3 |

## II- Course Objectives

|    |                                                                                                                               |
|----|-------------------------------------------------------------------------------------------------------------------------------|
| 1. | To introduce the fundamental concepts of Robotic Process Automation (RPA) and its evolution in automating business processes. |
| 2. | To enable students to design, sequence, and control automation workflows using RPA tools and techniques                       |
| 3. | To impart skills in application integration, recording, and data scraping for efficient automation.                           |
| 4. | To familiarize students with error handling, debugging, and code management for robust RPA solutions.                         |
| 5. | To equip students with knowledge of bot deployment, orchestration, and maintenance for scalable automation.                   |

## III- Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                   |                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------|
| <b>Preamble:</b> Robotic Process Automation (RPA) represents a transformative technology designed to enhance efficiency and accuracy in organizational workflows by automating repetitive and rule-based tasks. By leveraging software robots or "bots," RPA enables the seamless execution of tasks such as data entry, invoice processing, and report generation, minimizing human error and allowing employees to focus on strategic initiatives. |                                                   |                |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>INTRODUCTION TO ROBOTIC PROCESS AUTOMATION</b> | <b>6 Hours</b> |
| Emergence of Robotic Process Automation (RPA), Evolution of RPA, Differentiating RPA from Automation - Benefits of RPA - Application areas of RPA, Components of RPA, RPA Platforms. Robotic Process Automation Tools                                                                                                                                                                                                                                |                                                   |                |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>AUTOMATION PROCESS ACTIVITIES</b>              | <b>6 Hours</b> |
| Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations Controls: Finding the control, waiting for a control, Act on a control, Ui Explorer, Handling Events.                                                                                                                   |                                                   |                |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>APP INTEGRATION, RECORDING AND SCRAPING</b>    | <b>6 Hours</b> |
| App Integration, Recording, Scraping, Selector, Workflow Activities. Recording mouse and keyboard actions to perform operation, scraping data from website and writing to CSV.                                                                                                                                                                                                                                                                       |                                                   |                |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>EXCEPTION HANDLING AND CODE MANAGEMENT</b>     | <b>6 Hours</b> |
| Exception handling, Common exceptions, Logging- Debugging techniques, Error reporting. Code management and maintenance: Project organization, Nesting workflows, Reusability, Templates, Commenting techniques, State Machine, and version control in RPA.                                                                                                                                                                                           |                                                   |                |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>DEPLOYMENT AND MAINTENANCE</b>                 | <b>6 Hours</b> |
| Orchestration, Orchestration Server, Control bots, Orchestration Server to deploy bots, License management, Publishing and managing updates. RPA Vendors - Open-Source RPA, Security measures in RPA, Future of RPA                                                                                                                                                                                                                                  |                                                   |                |

TOTAL : 30 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401



**PRACTICAL EXERCISES:**

- 1 Setup and Configure a RPA tool and understand the user interface of the tool:
- 2 Create a Sequence to obtain user inputs display them using a message box.
- 3 Create a Flowchart to navigate to a desired page based on a condition.
- 4 Create a State Machine workflow to compare user input with a random number.
- 5 Build a process in the RPA platform using UI Automation Activities.
- 6 Create an automation process using key System Activities, Variables and Arguments
- 7 Also implement Automation using System Trigger
- 8 Automate login to (web)Email account
- 9 Recording mouse and keyboard actions.
- 10 Scraping data from website and writing to CSV
- 11 Implement Error Handling in RPA platform

**Note: The lab instructor is expected to design Problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.**

**TOTAL : 30 Periods**

**TOTAL : 30+30=60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Alok Mani Tripathi, Learning Robotic Process Automation, Packt Publishing (2018), 1sted.</li> <li>2. Richard Murdoch, Robotic Process Automation: A Guide for Business Leaders, Independently Published (2020), 1st ed.</li> <li>3. Rajesh R and Harish D, Robotic Process Automation Tools and Techniques, BPB Publications (2020), 1st ed.</li> </ol>                        |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. Frank Casale, Introduction to Robotic Process Automation: A Primer, Institute for Robotic Process Automation (2016), 1st ed.</li> <li>2. David Chappell, The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems, Wiley (2020), 1st ed.</li> <li>3. Debashis Guha, Robotic Process Automation: An Industry Handbook, CRC Press (2021), 1st ed.</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/108105063">https://nptel.ac.in/courses/108105063</a><br><a href="https://academy.uipath.com/learning-plans/automation-developer-professional-training-v2023-10">https://academy.uipath.com/learning-plans/automation-developer-professional-training-v2023-10</a>                                                                                                                   |

**IV- Course Outcomes**

| On completion of the course, the students will be able to |                                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the emergence, evolution, and benefits of RPA in business processes.                 | Understand (K2)      |
| <b>CO2</b>                                                | Develop and control automated workflows using RPA tools and activities.                      | Apply (K3)           |
| <b>CO3</b>                                                | Integrate applications, perform data recording and scraping using RPA.                       | Apply (K3)           |
| <b>CO4</b>                                                | Handle exceptions, debug errors, and manage code in automation projects.                     | Apply (K3)           |
| <b>CO5</b>                                                | Deploy, manage, and maintain bots in orchestration servers and explore future trends in RPA. | Apply (K3)           |

(Action verb of each CO to be matched with the next mapping table)



V- Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | 2        | -        | -        | -        | 2        | -        | -        | -        | -         | -         | -         | 3         | 2         | -         |
| CO-2        | 3        | 3        | -        | 2        | -        | -        | -        | -        | -        | -         | -         | -         | 3         | 3         | -         |
| CO-3        | -        | 3        | 3        | -        | 2        | -        | -        | -        | -        | -         | -         | -         | 3         | 3         | -         |
| CO-4        | 3        | -        | 3        | -        | -        | -        | -        | 2        | -        | -         | -         | -         | 3         | 3         | -         |
| CO-5        | 3        | -        | -        | -        | 2        | 3        | -        | -        | -        | -         | -         | -         | 3         | 2         | -         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I-Course Name: 23PCS21 - Cyber Security

| Prerequisite | Programme Name                 | Sem      | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                                                     |
|----|-----------------------------------------------------------------------------------------------------|
| 1. | Understand fundamental cyber security concepts, threats, and risk management principles             |
| 2. | Apply cryptographic techniques and network security protocols to safeguard data and communications. |
| 3. | Analyze system and application vulnerabilities and implement security controls.                     |
| 4. | Demonstrate skills in digital forensics and incident response to handle cybersecurity breaches.     |
| 5. | Evaluate emerging cybersecurity technologies and challenges in blockchain, AI, and IoT domains.     |

## III - Course Content

**Preamble:** This course equips learners with essential knowledge and practices to safeguard digital systems, networks, and data. It covers principles of security, cryptography, risk management, ethical hacking, and incident response. By addressing both technical and organizational aspects, the course prepares students to counter threats and ensure confidentiality, integrity, and availability of information.

|                                                                                                                                                                                              |                                              |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                              | <b>FOUNDATIONS OF CYBERSECURITY</b>          | <b>5 Periods</b> |
| CIA Triad: Confidentiality, Integrity, Availability, Types of Cyber Threats and Attacks, Security Policies and Risk Management, Introduction to Cyber Laws and Ethics.                       |                                              |                  |
| <b>Unit – II</b>                                                                                                                                                                             | <b>CRYPTOGRAPHY AND NETWORK SECURITY</b>     | <b>6 Periods</b> |
| Symmetric and Asymmetric Encryption Techniques, Hash Functions and Digital Signatures, Network Protocols and Security Measures, Firewalls, VPNs, and Intrusion Detection Systems.            |                                              |                  |
| <b>Unit – III</b>                                                                                                                                                                            | <b>SYSTEM AND APPLICATION SECURITY</b>       | <b>7 Periods</b> |
| Operating System Security: Access Controls, Patching, Web Application Security: SQL Injection, XSS, Secure Software Development Lifecycle (SSDLC), Mobile and Cloud Security Fundamentals.   |                                              |                  |
| <b>Unit - IV</b>                                                                                                                                                                             | <b>CYBER FORENSICS AND INCIDENT RESPONSE</b> | <b>7 Periods</b> |
| Digital Forensics: Data Acquisition and Analysis, Incident Detection and Response Strategies, Malware Analysis and Reverse Engineering Basics, Legal Procedures and Chain of Custody.        |                                              |                  |
| <b>Unit – V</b>                                                                                                                                                                              | <b>EMERGING TRENDS IN CYBERSECURITY</b>      | <b>5 Periods</b> |
| Blockchain and Cryptocurrency Security, Artificial Intelligence in Threat Detection, Internet of Things (IoT) Security Challenges, Cybersecurity in Critical Infrastructure and Smart Grids. |                                              |                  |

TOTAL: 30 Periods

## PRACTICAL EXERCISES:

1. Explore different types of cyber attacks (phishing, DoS, malware) using simulation tools (e.g., Cyber Range platforms).
2. Risk assessment and threat modeling of a sample IT system using frameworks like STRIDE or DREAD.
3. Implement symmetric key encryption and decryption algorithms (e.g., AES) in Python.
4. Capture and analyze network packets using Wireshark; identify protocols and potential vulnerabilities.
5. Configure and test firewall rules on a Linux system (iptables or UFW).

Chairperson-Board of Studies,   
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**TOTAL : 30 PERIODS**  
**TOTAL : 30+30=60 PERIODS**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 (Unit 1)</li> <li>2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011 (Unit 1)</li> </ol>                                                                                                                                                                                                                                                                                     |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones &amp; Bartlett Learning Publishers, 2013 (Unit 2)</li> <li>2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011 (Unit 3)</li> <li>3. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers, 2007 (Unit 3)</li> <li>4. William Stallings, Lawrie Brown, "Computer Security Principles and Practice", Third Edition, Pearson Education, 2015 (Units 4 and 5)</li> </ol> |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc23_cs127/preview">https://onlinecourses.nptel.ac.in/noc23_cs127/preview</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                     | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand fundamental cyber security concepts, threats, and risk management principles.            | Understand (K1)      |
| <b>CO2</b>                                                | Apply cryptographic techniques and network security protocols to safeguard data and communications. | Apply (K3)           |
| <b>CO3</b>                                                | Implement system and application vulnerabilities and security controls.                             | Apply (K3)           |
| <b>CO4</b>                                                | Demonstrate skills in digital forensics and incident response to handle cybersecurity breaches.     | Apply (K3)           |
| <b>CO5</b>                                                | Analyze emerging cybersecurity technologies and challenges in blockchain, AI, and IoT domains.      | Analyze (K4)         |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO-1</b> | 1    | 1    | 2    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2     | 2     | 1     | 1     | 1     | 2     |
| <b>CO-2</b> | 2    | 2    | 2    | 3    | 3    | 2    | 2    | 2    | 2    | 2    | 3     | 2     | 2     | 1     | 3     | 3     |
| <b>CO-3</b> | 2    | 2    | 1    | 1    | 2    | 1    | 1    | 2    | 2    | 2    | 1     | 1     | 1     | 3     | 3     | 3     |
| <b>CO-4</b> | 2    | 2    | 3    | 3    | 2    | 1    | 1    | 2    | 1    | 2    | 1     | 2     | 1     | 1     | 1     | 1     |
| <b>CO-5</b> | 1    | 2    | 3    | 2    | 3    | 2    | 2    | 1    | 2    | 2    | 2     | 1     | 1     | 3     | 3     | 3     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PCS22 - Quantum Computing**

| Prerequisite | Programme Name                 | Sem      | Category | L | T | P | C |
|--------------|--------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                                                                          |
|----|----------------------------------------------------------------------------------------------------------|
| 1. | To gain knowledge and skills related to 3D printing technologies.                                        |
| 2. | To learn the selection of material, equipment and development of a product for Industry 4.0 environment. |
| 3. | To understand the various software tools, process and techniques for digital manufacturing               |
| 4. | To understand the various process and techniques for digital manufacturing                               |
| 5. | To apply these techniques into various applications.                                                     |

**III - Course Content**

**Preamble:** This course explores the principles of quantum mechanics applied to computation. It introduces quantum bits, superposition, entanglement, and quantum algorithms that promise exponential speedups for certain classes of problems. Learners will gain insight into emerging technologies, tools, and applications of quantum computing in fields like cryptography, optimization, and machine learning.

|                                                                                                                                                                              |                                         |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                              | <b>QUANTUM COMPUTING BASIC CONCEPTS</b> | <b>5 Periods</b> |
| Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits – Super positions |                                         |                  |
| <b>Unit – II</b>                                                                                                                                                             | <b>QUANTUM GATES AND CIRCUITS</b>       | <b>7 Periods</b> |
| Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development - Quantum error correction                                                     |                                         |                  |
| <b>Unit – III</b>                                                                                                                                                            | <b>QUANTUM SEARCH ALGORITHMS</b>        | <b>7 Periods</b> |
| Quantum parallelism - Deutsch's algorithm - The Deutsch-Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm     |                                         |                  |
| <b>Unit - IV</b>                                                                                                                                                             | <b>QUANTUM INFORMATION THEORY</b>       | <b>6 Periods</b> |
| Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantum noiseless channel coding theorem - Classical information over noisy quantum channels    |                                         |                  |
| <b>Unit – V</b>                                                                                                                                                              | <b>QUANTUM MACHINE LEARNING</b>         | <b>5 Periods</b> |
| Introduction -QML Models- Introduction to Quantum Simulator(Qiskit)- Programming using Qiskit.                                                                               |                                         |                  |

**TOTAL: 30 PERIODS****LIST OF EXPERIMENTS:**

1. Single qubit gate simulation - Quantum Composer
2. Multiple qubit gate simulation - Quantum Composer
3. Composing simple quantum circuits with q-gates and measuring the output into classical bits.
4. IBM Qiskit Platform Introduction
5. Implementation of Shor's Algorithms
6. Implementation of Grover's Algorithm
7. Implementation of Deutsch's Algorithm
8. Implementation of Deutsch-Jozsa's Algorithm
9. Integer factorization using Shor's Algorithm
10. QKD Simulation

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401



11. Mini Project such as implementing an API for efficient search using Grover's Algorithms

**TOTAL : 30 PERIODS**

**TOTAL : 30+30=60 PERIODS**

|                            |                                                                                                                                                                                                                                                                                                   |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | <ol style="list-style-type: none"> <li>1. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction", First edition (1 November 2020).</li> <li>2. P. Kaye, R. Laflamme and M. Mosca, "An Introduction to Quantum Computing", Oxford University Press (2006).</li> </ol> |
| <b>Reference Books:</b>    | <ol style="list-style-type: none"> <li>1. NPTEL course on "Introduction to Quantum Computing: Quantum Algorithms and Qiskit" by IBM and IIT Madras.</li> </ol>                                                                                                                                    |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc25_cs95/preview">https://onlinecourses.nptel.ac.in/noc25_cs95/preview</a>                                                                                                                                                                           |

#### IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the basics of quantum computing                                | Understand (K2)      |
| <b>CO2</b>                                                | Understand the background of Quantum Mechanics.                           | Understand (K2)      |
| <b>CO3</b>                                                | Analyze the computation models.                                           | Apply (K3)           |
| <b>CO4</b>                                                | Model the circuits using quantum computation environments and frameworks. | Apply (K3)           |
| <b>CO5</b>                                                | Analyze the quantum operations such as noise and error-correction         | Analyze (K4)         |

#### V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO-1</b> | 3    | 1    | 1    | 2    | 2    | 1    | 1    | 1    | 1    | 2    | 1     | -     | -     | 1     | 2     | 3     |
| <b>CO-2</b> | 3    | 2    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1     | -     | -     | 2     | 3     | 2     |
| <b>CO-3</b> | 2    | 3    | 2    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2     | -     | -     | 2     | 2     | 3     |
| <b>CO-4</b> | 2    | 2    | 3    | 2    | 3    | 2    | 2    | 1    | 2    | 1    | 2     | -     | -     | 1     | 3     | 2     |
| <b>CO-5</b> | 2    | 3    | 2    | 3    | 2    | 1    | 1    | 1    | 1    | 1    | 2     | -     | -     | 2     | 2     | 3     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I-Course Name: 23PCS23 - 3D Printing and Design**

| Prerequisite      | Programme Name                         | Sem      | Category | L | T | P | C |
|-------------------|----------------------------------------|----------|----------|---|---|---|---|
| Computer Graphics | B.E/B.Tech – Common to CSE, IT , AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                                                                                             |
|----|-----------------------------------------------------------------------------------------------------------------------------|
| 1. | To introduce the fundamentals, history, and workflow of 3D Printing and Additive Manufacturing (AM).                        |
| 2. | To provide knowledge of AM processes, material selection, and characterization techniques.                                  |
| 3. | To familiarize students with system design aspects, including printer hardware, control systems, and material formulations. |
| 4. | To develop an understanding of metal AM technologies, hybrid manufacturing, and their industrial relevance.                 |
| 5. | To expose students to post-processing, testing methods, standards, safety norms, and industrial applications of AM.         |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                             |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------|
| <b>Preamble:</b> 3D Printing and Design introduces learners to additive manufacturing techniques that transform digital models into physical objects. It emphasizes design principles, material selection, and process optimization for rapid prototyping. The course bridges creativity and technology, enabling innovation across engineering, medical, and industrial domains. Students gain hands-on experience in modeling, slicing, and printing to develop functional and aesthetic prototypes. |                                                             |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Fundamentals of 3D - Printing and AM Workflow</b>        | <b>5 Periods</b> |
| History and Evolution of 3D Printing -Design Considerations: Resolution, Layer Height, Material Compatibility -3D Modeling & Viewing: Digital Design Tools, File Formats (STL, AMF, OBJ) - Scanning Technologies: Structured Light, CT & Laser Scanning -3D Printing Workflow: Slicing, Toolpath Generation, Support Structures -CAD Preprocessing and Simulation Tools for Printability Assessment                                                                                                    |                                                             |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Materials and Processes in AM</b>                        | <b>6 Periods</b> |
| Additive Manufacturing Processes: Extrusion, Binder Jetting, Vat Polymerization, Material Jetting, Powder Bed Fusion (PBF), Directed Energy Deposition (DED), Sheet Lamination - Material Selection Criteria: Polymers, Metals, Ceramics, Biomaterials, Composites, Hydrogels - Characterization Techniques: Rheology, Flow Characteristics, Microstructure, Porosity, Mechanical Properties Process-Property-Relationships and Design Limitations                                                     |                                                             |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>System Design and Inkjet/Extrusion Technologies</b>      | <b>6 Periods</b> |
| Printer Hardware: Print Head Types (Thermal, Piezoelectric, CIJ), Print Bed, Motion Systems -Control Systems: Sensors, Feedback Loops, Actuators -DIY Printer Design: Chassis, Extruder Mechanisms, Embedded Systems (Arduino/RPi) -Material Formulations for Jetting & Extrusion                                                                                                                                                                                                                      |                                                             |                  |
| <b>Unit - IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Metal Additive Manufacturing &amp; Hybrid Techniques</b> | <b>6 Periods</b> |
| Classification Based on ASTM Standards -Metal AM Technologies: Direct Metal Laser Sintering (DMLS), Selective Laser Melting (SLM), Electron Beam Melting (EBM), Laser-DED -Differences between AM vs. Casting vs. CNC Machining -Case Studies: Aerospace Brackets, Biomedical Implants, Turbine Components Hybrid Manufacturing -Approaches and Design for Metal AM                                                                                                                                    |                                                             |                  |

| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                    | Postprocessing, Testing, and Industrial Applications | 6 Periods |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------|
| Surface Treatment: Machining, Sanding, Thermal, Chemical, Plasma, Electrochemical - Heat Treatment & Microstructure Optimization -Testing Methods: NDT, Surface Roughness, Dimensional Accuracy, Microhardness, XRD, FESEM -Standards & Safety: -ASTM, ISO, Regulatory Norms- Industrial Applications: Medical (Bioprinting, Implants), Aerospace, Automotive, Architecture, Fashion -Future Trends: 4D Printing, Smart Materials, AI in AM |                                                      |           |

TOTAL: 30 Periods

**LIST OF EXPERIMENTS:**

1. 3D CAD Modeling & Slicing – Designing a sample model and generating G-code.
2. Polymer Extrusion Printing – Printing a simple 3D object using FDM.
3. Support Structures & Toolpath Optimization – Analyzing print accuracy with/without supports.
4. Material Testing – Polymers – Tensile/impact test of 3D printed specimens.
5. Surface Finishing & Post-Processing – Sanding, chemical, or thermal finishing of prints.
6. Metal AM Simulation – Process simulation of DMLS/SLM using software tools.
7. Quality Testing in AM – Measuring surface roughness, dimensional accuracy, microhardness.
8. Case Study Implementation – Printing a biomedical implant/aerospace bracket prototype.

TOTAL : 30 Periods

TOTAL : 30+30=60 Periods

|                            |                                                                                                                                                                                                                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1.Ian Gibson et al., Additive Manufacturing Technologies, Springer, 2015.<br>2.Joshi et al., Additive Manufacturing with Metals, Springer, 2023.                                                                                 |
| <b>Reference Books:</b>    | 1. Patri Venuvinod, Weiyin Ma, Rapid Prototyping: Laser-based and Other Technologies, Springer, 2004.<br>2. D.T. Pham, S.S. Dimov, Rapid Manufacturing, Springer, 2001.<br>3. Joan Horvath, Mastering 3D Printing, APress, 2014. |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.swayam2.ac.in/ntr24_ed17/preview-">https://onlinecourses.swayam2.ac.in/ntr24_ed17/preview-</a>                                                                                                    |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                                                   | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the fundamentals and design principles of 3D Printing/Additive Manufacturing (AM)                                                      | Understand (K2)      |
| CO2                                                       | To develop competency in AM workflows, material selection, and process simulation.                                                                | Apply (K3)           |
| CO3                                                       | To explore post-processing, quality testing, and application areas aligned with industrial practices.                                             | Analyze (K4)         |
| CO4                                                       | Analyze recent advancements in metal AM and hybrid systems.                                                                                       | Analyze (K4)         |
| CO5                                                       | Analyze surface treatments, testing methods, standards, and safety practices in AM, and evaluate their industrial applications and future trends. | Analyze (K4)         |

V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | 2        | -        | 1        | 2        | -        | -        | -        | -        | -        | 2         | -         | 1         | -         | -         | -         |
| CO-2        | 2        | 3        | 2        | 2        | 3        | -        | 1        | -        | -        | -        | 2         | -         | 2         | -         | -         | -         |
| CO-3        | 2        | 2        | 3        | 3        | 3        | 1        | -        | -        | -        | -        | 2         | 1         | 2         | -         | -         | -         |
| CO-4        | 2        | 2        | 2        | 3        | 2        | -        | -        | 1        | -        | -        | 2         | -         | 2         | -         | -         | -         |
| CO-5        | 2        | 3        | -        | 1        | 2        | -        | -        | -        | -        | -        | 2         | -         | 1         | -         | -         | -         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23PAD09 - Knowledge Engineering**

| Prerequisite | Program Name                           | Sem      | Category | L | T | P | C |
|--------------|----------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to CSE, IT , AI&DS | V/VI/VII | ESC      | 2 | 0 | 2 | 3 |

**II - Course Objectives**

|    |                                                       |
|----|-------------------------------------------------------|
| 1. | Understand the Foundations of Knowledge-Based Systems |
| 2. | Learn Knowledge Representation Techniques             |
| 3. | Develop Skills in Knowledge Acquisition and Modeling  |
| 4. | To apply reasoning with ontologies and rules          |
| 5. | To understand learning and rule learning.             |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                            |                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|
| <b>Preamble:</b> This course is designed to equip learners with the theoretical foundations and practical methodologies required to build knowledge-based systems. It emphasizes logical reasoning, probabilistic inference, fuzzy logic, and structured knowledge representation, which together form the core of intelligent behavior in machines.                                                                                         |                                            |                |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>REASONING UNDER UNCERTAINTY C</b>       | <b>6 Hours</b> |
| Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods- Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning – Knowledge Engineering. Bayesian reasoning, belief functions, and fuzzy logic                                                                             |                                            |                |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>METHODOLOGY AND MODELING</b>            | <b>6 Hours</b> |
| Conventional Design and Development – Development tools and Reusable Ontologies – Agent-Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability-Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios. Introduces agent architecture, decision models, and design methodologies. |                                            |                |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>ONTOLOGIES – DESIGN AND DEVELOPMENT</b> | <b>6 Hours</b> |
| Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features –Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification                                                                                        |                                            |                |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>REASONING WITH ONTOLOGIES AND RULES</b> | <b>6 Hours</b> |
| Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching– Partially Learned Knowledge – Reasoning with Partially Learned Knowledge. Covers production rules, Drools/CLIPS-style systems in depth                                                                                                          |                                            |                |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>LEARNING AND RULE LEARNING</b>          | <b>6 Hours</b> |
| Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement –Overview – Rule Generation and Analysis – Hypothesis Learning, NLP-based Knowledge Acquisition                                                                                                                                                  |                                            |                |

**TOTAL: 30 PERIODS**

Chairperson Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401



**LIST OF EXPERIMENTS:**

1. Perform operations with Evidence Based Reasoning.
2. Perform Evidence based Analysis.
3. Perform operations on Probability Based Reasoning.
4. Perform Believability Analysis.
5. Implement Rule Learning and refinement.
6. Perform analysis based on learned patterns.
7. Construction of Ontology for a given domain.

**TOTAL : 30 Periods****TOTAL : 30+30=60 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016. (Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4 / Unit 3 – Chapter 5, 6 / Unit 4 - 7 , Unit 5 – Chapter 8, 9 )                                                                                                                                                                                                            |
| <b>Reference Books:</b>    | 1. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.<br>2. Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018.<br>3. John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.<br>4. King , Knowledge Management and Organizational Learning , Springer, 2009.<br>5. Jay Liebowitz, Knowledge Management Learning from Knowledge Engineering, 1st Edition, 2001 |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/106106179">https://nptel.ac.in/courses/106106179</a>                                                                                                                                                                                                                                                                                                                                                                                                                             |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the core concepts and scope of knowledge engineering, including types and sources of knowledge.       | Understand (K2)      |
| <b>CO2</b>                                                | Describe various knowledge representation techniques such as logic, frames, semantic networks, and ontologies    | Understand (K2)      |
| <b>CO3</b>                                                | Implement reasoning techniques under uncertainty, including fuzzy logic, Bayesian inference, and belief networks | Apply (K3)           |
| <b>CO4</b>                                                | Design intelligent agents and rule-based systems using appropriate knowledge engineering methodologies           | Apply (K3)           |
| <b>CO5</b>                                                | Develop and reason with ontologies using semantic web technologies like RDF, OWL, and SPARQL                     | Analyze (K4)         |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-<br>1 | PO-<br>2 | PO-<br>3 | PO-<br>4 | PO-<br>5 | PO-<br>5 | PO-<br>6 | PO-<br>7 | PO-<br>8 | PO-<br>9 | PO-<br>10 | PO-<br>11 | PO-<br>12 | PSO-<br>1 | PSO-<br>2 | PSO-<br>3 |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO-1        | 3        | 1        | 1        | 1        | 1        | 1        | 1        | -        | -        | 1        | 2         | 1         | 2         | 1         | 1         | 1         |
| CO-2        | 3        | 2        | 3        | 2        | 2        |          | -        | -        | -        | 2        | 2         | 1         | 1         | 2         | 1         | 2         |
| CO-3        | 2        | 2        | 3        | 2        | 2        |          | -        | -        | -        | 1        | 2         | 2         | 2         | 1         | 2         | 1         |
| CO-4        | 2        | 2        | 3        | 1        | 1        |          | -        | -        | -        | 2        | 2         | 2         | 2         | 2         | 2         | 2         |
| CO-5        | 2        | 2        | 2        | 1        | 1        |          | -        | -        | -        | 2        | 2         | 1         | 2         | 1         | 2         | 2         |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PAD08 - Soft Computing

| Prerequisite             | Programme Name                         | Sem      | Category | L | T | P | C |
|--------------------------|----------------------------------------|----------|----------|---|---|---|---|
| Probability & Statistics | B.E/B.Tech – Common to CSE, IT , AI&DS | V/VI/VII | ESC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                               |
|----|-------------------------------------------------------------------------------|
| 1. | Classify the various soft computing frame works                               |
| 2. | Be familiar with the design of neural networks, fuzzy logic and fuzzy systems |
| 3. | Learn mathematical background for optimized genetic programming               |
| 4. | Design and Implement Soft Computing-Based Solutions                           |
| 5. | Be exposed to neuro-fuzzy hybrid systems and its applications                 |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                           |                                       |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------------------|
| <b>Preamble:</b> This course introduces the foundational principles and techniques of Soft Computing, including Fuzzy Logic, Artificial Neural Networks, Genetic Algorithms, and Probabilistic Reasoning. These methods do not rely on exact models but instead mimic human reasoning to arrive at satisfactory solutions with limited or imprecise data. |                                       |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                           | <b>Introduction to Soft Computing</b> | <b>9 Periods</b> |
| Introduction to Soft Computing: Artificial Intelligence, Neural Networks, Fuzzy Systems, Genetic Algorithms, Swarm Intelligence. McCulloch & Pitts model, Hebbian and Delta learning rules, Perceptron, Adaline, Madaline. Soft vs Hard computing, soft computing characteristics, Applications in robotics, NLP, medical diagnosis.                      |                                       |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                          | <b>Artificial Neural Networks</b>     | <b>9 Periods</b> |
| Backpropagation, Kohonen maps, Learning Vector Quantization, Hamming NN, Hopfield NN, BAM, ART, SVM. Spike neural networks, Deep learning transition from soft computing.                                                                                                                                                                                 |                                       |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                         | <b>Fuzzy Logic Systems</b>            | <b>9 Periods</b> |
| Classical & fuzzy sets, fuzzy relations, membership functions, defuzzification, arithmetic, rule base, reasoning. Fuzzy controllers, TSK model, Fuzzy clustering (FCM)                                                                                                                                                                                    |                                       |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                          | <b>Genetic Algorithms</b>             | <b>9 Periods</b> |
| Concepts, encoding, fitness, reproduction, crossover, mutation, convergence. Multi-objective GA, Pareto optimality, evolutionary strategy (ES)                                                                                                                                                                                                            |                                       |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                           | <b>Hybrid Systems</b>                 | <b>9 Periods</b> |
| Combining ANN, Fuzzy, GA; Fuzzy BP, fuzzy neuron, fuzzy ART. Neuro-fuzzy inference systems (ANFIS), Evolutionary neural networks, applications in adaptive control                                                                                                                                                                                        |                                       |                  |

**TOTAL: 45 PERIODS**

|                         |                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | 1. K. K. Mishra, N. Das, P. K. Sa, Soft Computing: Fundamentals and Applications, Springer, 2024                                                                                                                                                                                                                                                                                        |
| <b>Reference Books:</b> | 1. S. Rajasekaran, G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Systems and Evolutionary Algorithms, PHI, 2023<br>2. F. O. Karry, C. V. Thomas, Soft Computing and Intelligent Systems Design, Pearson, 2023<br>3. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley, 2020<br>4. Sandhya Samarasinghe, Introduction to Artificial Neural Networks and Deep Learning, |

|                           |                                                                                                                                                                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           | CRC Press, 2021<br>5. J. Sivanandam, S. N. Deepa, Genetic Algorithms: Concepts and Applications, Springer, 2020B. K. Tripathy, J. Anuradha, Soft Computing Techniques and Applications, OUP, 2019 |
| <b>MOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/106106179">https://nptel.ac.in/courses/106106179</a>                                                                                                         |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                      | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the fundamentals and scope of soft computing.             | Understand (K2)      |
| <b>CO2</b>                                                | Apply neural networks for pattern recognition and classification.    | Apply (K3)           |
| <b>CO3</b>                                                | Design fuzzy logic systems and apply fuzzy inference.                | Apply (K3)           |
| <b>CO4</b>                                                | Solve optimization problems using genetic algorithms.                | Apply (K3)           |
| <b>CO5</b>                                                | Develop hybrid systems using neural, fuzzy, and evolutionary models. | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO-1</b> | 3    | 2    | -    | -    | 1    | -    | -    | -    | -    | -    | -     | 2     | 3     | 3     | 2     | 1     |
| <b>CO-2</b> | 2    | 3    | 2    | 2    | 2    | -    | -    | -    | -    | -    | -     | 2     | 2     | 2     | 2     | 2     |
| <b>CO-3</b> | 3    | 3    | 3    | 2    | 2    | -    | -    | -    | -    | -    | -     | 2     | 3     | 2     | 3     | 2     |
| <b>CO-4</b> | 2    | 2    | 3    | 2    | 3    | -    | -    | -    | -    | -    | -     | 2     | 2     | 2     | 3     | 2     |
| <b>CO-5</b> | 3    | 3    | 3    | 2    | 3    | -    | -    | -    | -    | -    | -     | 2     | 3     | 2     | 3     | 2     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401

## I - Course Name: 23PAD10 - Optimization Techniques

| Prerequisite | Programme Name                        | Sem      | Category | L | T | P | C |
|--------------|---------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                                                                                       |
|----|---------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To introduce classical and modern optimization methods with a focus on solving real-world engineering and management problems.        |
| 2. | To formulate and solve Linear Programming Problems (LPP) using graphical and simplex-based techniques, including integer programming. |
| 3. | To analyze and optimize project networks using CPM, PERT, and understand their cost implications.                                     |
| 4. | To apply techniques for solving constrained and unconstrained optimization problems using analytical methods.                         |
| 5. | To understand the fundamentals of queuing theory and analyze various queuing models with practical case studies.                      |

## III - Course Content

|                                                                                                                                                                                                                                                                           |                                                        |                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------|
| <b>Preamble:</b> This course introduces techniques to model and solve real-world optimization problems in engineering and management. It covers linear programming, network models, queuing theory, and both classical and modern optimization methods.                   |                                                        |                |
| <b>Unit – I</b>                                                                                                                                                                                                                                                           | <b>LINEAR MODELS</b>                                   | <b>6 Hours</b> |
| Optimization - classical optimization, Optimality criteria – Necessary and sufficient conditions for existence of extreme point Introduction of Operations Research - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Two-Phase method – |                                                        |                |
| <b>Unit – II</b>                                                                                                                                                                                                                                                          | <b>INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS</b> | <b>6 Hours</b> |
| Integer programming: Branch and bound method- Transportation and Assignment problems - Traveling salesman problem.                                                                                                                                                        |                                                        |                |
| <b>Unit – III</b>                                                                                                                                                                                                                                                         | <b>PROJECT SCHEDULING</b>                              | <b>6 Hours</b> |
| Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM - Non-traditional algorithms                                                                                                                    |                                                        |                |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                          | <b>CLASSICAL OPTIMIZATION THEORY</b>                   | <b>6 Hours</b> |
| Constrained optimization - Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions.                                                           |                                                        |                |
| <b>Unit – V</b>                                                                                                                                                                                                                                                           | <b>QUEUING MODELS</b>                                  | <b>6 Hours</b> |
| Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels - Case studies                                                        |                                                        |                |

**TOTAL: 30 PERIODS****LIST OF EXPERIMENTS:**

1. Solving simplex maximization problems using R programming.
2. Solving simplex minimization problems using R programming.
3. Solving mixed constraints problems – Big M & Two phase method using TORA.
4. Solving transportation problems using R.

5. Solving assignment problems using R.
6. Solving optimization problems using LINGO.
7. Studying Primal-Dual relationships in LP using TORA.
8. Sensitivity & post optimality analysis using LINGO.
9. Solving shortest route problems using optimization software
10. Solve single server queuing model using simulation software package.
11. Solve multi server queuing model using simulation software package.

TOTAL : 30 PERIODS

TOTAL : 30+30=60 PERIODS

|                            |                                                                                                                                                                                        |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1.Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.                                                                                                     |
| <b>Reference Books:</b>    | 1.ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.<br>2.J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.- |
| <b>MOOC/Web Platforms:</b> | www.courseera.com                                                                                                                                                                      |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Formulate and solve linear programming problems (LPP)                          | Understand (k2)      |
| CO2                                                       | Describe Integer Programming Problems, Transportation and Assignment Problems. | Understand (k2)      |
| CO3                                                       | Obtain a solution to network problems using CPM and PERT techniques.           | Apply (k3)           |
| CO4                                                       | Optimize the function subject to the constraints.                              | Analyze (K4)         |
| CO5                                                       | Solve problems under Markovian queuing models                                  | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| CO-1        | 3    | 2    | —    | 1    | —    | —    | —    | —    | —    | —    | —     | 2     | 2     | —     | —     |
| CO-2        | 3    | 3    | 2    | 3    | 2    | —    | —    | —    | —    | 1    | —     | 2     | 3     | 2     | —     |
| CO-3        | 2    | 2    | 3    | 2    | 2    | 1    | —    | —    | 2    | 2    | 1     | 2     | 3     | 2     | —     |
| CO-4        | 3    | 3    | 2    | 3    | 2    | —    | —    | —    | —    | 1    | —     | 3     | 3     | 3     | —     |
| CO-5        | 3    | 3    | 2    | 3    | 3    | 1    | —    | —    | —    | 2    | —     | 3     | 3     | 3     | —     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23PAD11- Game Theory**

| Prerequisite | Programme Name                         | Sem      | Category | L | T | P | C |
|--------------|----------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to CSE, IT , AI&DS | V/VI/VII | PEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|    |                                                                                                                                                                                                                            |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To introduce the student to the notion of a game, its solutions concepts, and other basic notions and tools of game theory, and the main applications for which they are appropriate, including electronic trading markets |
| 2. | To formalize the notion of strategic thinking and rational choice by using the tools of game theory, and to provide insights into using game theory in modeling applications                                               |
| 3. | To draw the connections between game theory, computer science, and economics, especially emphasizing the computational issues                                                                                              |
| 4. | To introduce contemporary topics in the intersection of game theory, computer science, and economics                                                                                                                       |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                 |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------|
| <b>Preamble:</b> This course on Game Theory introduces students to fundamental concepts such as strategic games, Nash equilibrium, dominance, mixed strategies, cooperative games, and mechanism design. By exploring both classical and modern approaches, students will gain insight into decision-making processes in multi-agent environments                                                                                      |                                                 |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>INTRODUCTION</b>                             | <b>9 Periods</b> |
| Making rational choices: basics of Games — strategy — preferences — payoffs — Mathematical basics — Game theory — Rational Choice — Basic solution concepts-non cooperative versus cooperative games — Basic computational issues — finding equilibria and 190 learning in games- Typical application areas for game theory (e.g. Google's sponsored search- eBay auctions- electricity trading markets).                              |                                                 |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>GAMES WITH PERFECT INFORMATION</b>           | <b>9 Periods</b> |
| Games with Perfect Information — Strategic games — prisoner's dilemma- matching pennies - Nash equilibria —mixed strategy equilibrium — potential games- games with infinite strategy space - Braess paradox- price of anarchy.                                                                                                                                                                                                        |                                                 |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>STATIC GAMES WITH INCOMPLETE INFORMATION</b> | <b>9 Periods</b> |
| Mixed and Behavioral strategies -Games with Imperfect Information — Bayesian Games — Motivational Examples — General Definitions — Information aspects — Illustrations — Extensive Games with Imperfect — Information — Strategies — definition- examples- games of imperfect information- games of incomplete information- repeated games- the folk theorem of average payoffs. —Repeated Games — The Prisoner's Dilemma — Bargaining |                                                 |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>NON-COOPERATIVE GAME THEORY</b>              | <b>9 Periods</b> |
| Non-cooperative Game Theory — Self-interested agents — Games in normal form — Analyzing games: from optimality to equilibrium — Computing Solution Concepts of Normal — Form Games — Computing Nash equilibria of two-player- zero-sum games —Computing Nash equilibria of twoplayer- general- sum games — Identifying dominated strategies                                                                                            |                                                 |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>MECHANISM DESIGN</b>                         | <b>9 Periods</b> |
| Aggregating Preferences — Social Choice — Formal Model — Voting — Existence of social functions — Ranking systems — Protocols for Strategic Agents: Mechanism Design — Mechanism design with unrestricted preferences- Fair division- stable matching and allocation- auctions- truthful auctions in win/lose settings                                                                                                                 |                                                 |                  |

Chairperson-Board of Studies,

Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

TOTAL: 45 Periods

|                            |                                                                                                                                                                                                                                                  |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1.M. J. Osborne- An Introduction to Game Theory. Oxford University Press- 2012                                                                                                                                                                   |
| <b>Reference Books:</b>    | 1.. M. Machler- E. Solan- S. Zamir- Game Theory- Cambridge University Press- 2013.<br>2..Zhu Han- DusitNiyato- WalidSaad- TamerBasar and Are Hjorungnes- "Game Theory in Wireless and Communication Networks"- Cambridge University Press- 2012. |
| <b>MOOC/Web Platforms:</b> | SWAYAM – Introduction to Soft Computing (IIT Kharagpur)                                                                                                                                                                                          |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the notion of a strategic game and equilibria and identify the characteristics of main applications of these concepts. | Understand (K2)      |
| <b>CO2</b>                                                | Describe key examples like the Prisoner's Dilemma, matching pennies, and their Nash equilibria                                 | Understand (K2)      |
| <b>CO3</b>                                                | Explain mixed and behavioral strategies in games with imperfect or incomplete information                                      | Understand (K2)      |
| <b>CO4</b>                                                | Apply solution concepts to normal-form games, including two-player zero-sum and general-sum games                              | Apply (K3)           |
| <b>CO5</b>                                                | Analyze the fundamentals of social choice, preference aggregation, and voting model                                            | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO-1</b> | 3    | 2    | -    | -    | 1    | -    | -    | -    | -    | -    | -     | 2     | 3     | 3     | 2     | 1     |
| <b>CO-2</b> | 2    | 3    | 2    | 2    | 2    | -    | -    | -    | -    | -    | -     | 2     | 2     | 2     | 2     | 2     |
| <b>CO-3</b> | 3    | 3    | 3    | 2    | 2    | -    | -    | -    | -    | -    | -     | 2     | 3     | 2     | 3     | 2     |
| <b>CO-4</b> | 2    | 2    | 3    | 2    | 3    | -    | -    | -    | -    | -    | -     | 2     | 2     | 2     | 3     | 2     |
| <b>CO-5</b> | 3    | 3    | 3    | 2    | 3    | -    | -    | -    | -    | -    | -     | 2     | 3     | 2     | 3     | 2     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23PAD13 - Cognitive Science

| Prerequisite | Programme Name                        | Sem      | Category | L | T | P | C |
|--------------|---------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                         |
|----|-------------------------------------------------------------------------|
| 1. | To know the theoretical background of cognition.                        |
| 2. | To understand the link between cognition and computational intelligence |
| 3. | To explore probabilistic programming language                           |
| 4. | To study the computational inference models of cognition                |
| 5  | To study the computational learning models of cognition.                |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                   |                                                                    |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------|
| <b>Preamble:</b> This course introduces students to the fundamental theories, models, and experimental methods used to study cognition. It examines how humans acquire, process, and represent knowledge, and how these processes can be modeled computationally. Topics include perception, memory, attention, problem-solving, language acquisition, and cognitive development. |                                                                    |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                   | <b>Philosophy, Psychology, and Neuroscience</b>                    | <b>9 Periods</b> |
| Foundations of Cognitive Science: Mental-Physical Relation, Materialism to Mental Science-Psychology's role within Cognitive Science - Science of Information Processing-Cognitive Neuroscience: Brain Anatomy and Functions Perception, Decision-Making, Learning, Memory Language Understanding and Processing                                                                  |                                                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                  | <b>Computational Intelligence</b>                                  | <b>9 Periods</b> |
| Machines and Cognition Overview-Artificial Intelligence basics Architectures of Cognition Knowledge - Based Systems Logical Representation and Reasoning-Logical Decision Making-Learning, Language, and Vision in Cognitive Systems                                                                                                                                              |                                                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                 | <b>Probabilistic Programming and Information Processing Models</b> | <b>9 Periods</b> |
| Introduction to Probabilistic Programming Languages (Web PPL)-Syntax and usage of Web PPL and Javascript libraries -Physical Symbol System Hypothesis Language of Thought Theory- Neural Networks and Distributed Information Processing                                                                                                                                          |                                                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                  | <b>Inference Models of Cognition</b>                               | <b>9 Periods</b> |
| Generative Models and Conditioning-Causal and Statistical Dependence-Modular architectures of the mind-Neuroscience methods for cognitive study                                                                                                                                                                                                                                   |                                                                    |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                   | <b>Learning Models of Cognition and Advanced Topics</b>            | <b>9 Periods</b> |
| Learning as Conditional Inference-Hierarchical Models and Mixture Models-Dynamical Systems in Cognitive Science-Situated Cognition and Biorobotics Global Workspace Theory of Consciousness-Artificial Brain Systems                                                                                                                                                              |                                                                    |                  |

**TOTAL: 45 PERIODS**

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b> | 1. Vijay V Raghavan, Venkat N. Gudivada, Venu Govindaraju, C.R. Rao, Cognitive Computing: Theory and Applications: (Handbook of Statistics 35), Elsevier publications, 2016<br>2. Judith Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big Data Analytics, Wiley Publications, 2015<br>3. Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences", The MIT Press, 1999.<br>4. Jose Luis Bermúdez, Cognitive Science -An Introduction to the Science of the Mind, |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                            |                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            | Cambridge University Press 2020                                                                                                                                                                                                                                                                                                                                                               |
| <b>Reference Books:</b>    | 1. Noah D. Goodman, Andreas Stuhlmüller, "The Design and Implementation of Probabilistic Programming Languages", Electronic version of book, <a href="https://dippl.org/">https://dippl.org/</a> . 2. Noah D. Goodman, Joshua B. Tenenbaum, The Prob Mod Contributors, "Probabilistic Models of Cognition", Second Edition, 2016, <a href="https://probmods.org/">https://probmods.org/</a> . |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc22_ee122/preview">https://onlinecourses.nptel.ac.in/noc22_ee122/preview</a>                                                                                                                                                                                                                                                                     |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                          | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Demonstrate cognitive neuroscience concepts like brain functions, perception, and memory | Understand (K2)      |
| <b>CO2</b>                                                | Apply probabilistic programming to model cognitive processes                             | Apply (K3)           |
| <b>CO3</b>                                                | Develop AI-based cognitive models such as generative and hierarchical models             | Apply (K3)           |
| <b>CO4</b>                                                | Implement neural network simulations for cognitive tasks like language learning          | Apply (K3)           |
| <b>CO5</b>                                                | Analyze experimental data using inference and dynamical systems methods.                 | Analyze (K4)         |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO-1</b> | 3    | 2    | 3    | 3    | 1    | -    | -    | -    | 1    | 2     | 1     | 1     | 3     | 1     | 1     |
| <b>CO-2</b> | 2    | 1    | 1    | 2    | 1    | -    | -    | -    | 1    | 2     | 1     | 1     | 3     | 3     | 1     |
| <b>CO-3</b> | 2    | 3    | 1    | 1    | 3    | -    | -    | -    | 2    | 1     | 1     | 2     | 3     | 2     | 2     |
| <b>CO-4</b> | 3    | 1    | 3    | 3    | 2    | -    | -    | -    | 2    | 2     | 3     | 1     | 2     | 1     | 3     |
| <b>CO-5</b> | 3    | 1    | 1    | 3    | 3    | -    | -    | -    | 2    | 3     | 3     | 3     | 1     | 3     | 3     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I- Course Name: 23PAD17 - Ethics and AI

| Prerequisite | Programme Name                        | Sem      | Category | L | T | P | C |
|--------------|---------------------------------------|----------|----------|---|---|---|---|
| Nil          | B.E/B.Tech – Common to CSE, IT, AI&DS | V/VI/VII | PEC      | 2 | 0 | 2 | 3 |

## II - Course Objectives

|    |                                                                             |
|----|-----------------------------------------------------------------------------|
| 1. | Study the morality and ethics in AI                                         |
| 2. | Learn about the Ethical initiatives in the field of artificial intelligence |
| 3. | Study about AI standards and Regulations                                    |
| 4. | Study about social and ethical issues of Robot Ethics                       |
| 5  | Study about AI and Ethics- challenges and opportunities                     |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                               |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------|
| <b>Preamble:</b> This course aims to develop a critical understanding of how AI systems affect human values such as fairness, privacy, accountability, transparency, and autonomy. It examines ethical frameworks and regulatory perspectives necessary to evaluate the development and deployment of AI systems responsibly.                                                                                                                                                                 |                                                               |                  |
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>INTRODUCTION</b>                                           | <b>9 Periods</b> |
| Understanding morality and ethics within Artificial Intelligence, Effects of AI on society and social structures, Psychological impacts of AI on human behavior, Legal system implications related to AI technologies, Environmental consequences and planetary impact of AI deployment, Building and maintaining trust in AI systems                                                                                                                                                         |                                                               |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Ethical Initiatives In AI</b>                              | <b>9 Periods</b> |
| Overview of global ethical frameworks and initiatives in AI, Identifying potential ethical harms and concerns arising from AI, Case studies exploring ethical challenges in healthcare robots, autonomous vehicles, and military applications including Vaponization                                                                                                                                                                                                                          |                                                               |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>AI Standards and Regulation</b>                            | <b>9 Periods</b> |
| Frameworks for addressing ethical issues during AI system design, Ensuring transparency in autonomous AI systems, Processes and protocols for data privacy protection, Addressing algorithmic bias and fairness concerns, Ontological standards guiding ethical robotics and automation                                                                                                                                                                                                       |                                                               |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Roboethics: Social and Ethical Implication of Robotics</b> | <b>9 Periods</b> |
| Foundations and principles of robot ethics (roboethics), Relationship between ethics and morality in robotics, Examination of moral theories relevant to AI and robotics, Ethical considerations in science and technological advancements, Ethical challenges in Information and Communication Technology (ICT) societies, Harmonizing diverse ethical principles across fields, Professional responsibility and ethical conduct in robotics, Classification and taxonomy within robo ethics |                                                               |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>AI And Ethics- Challenges and Opportunities</b>            | <b>9 Periods</b> |
| Current ethical challenges and potential opportunities in AI development, Exploration of major ethical issues inherent in artificial intelligence, Societal implications of applying AI in healthcare and medicine, Role of AI in decision-making processes across industries, Overview of national and international policies and strategies concerning AI ethics                                                                                                                            |                                                               |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NP/RCET College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401

TOTAL: 45 Periods



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield, "The ethics of artificial intelligence: Issues and initiatives", EPRS   European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020<br>2. Patrick Lin, Keith Abney, George A Bekey, " Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Reference Books:</b>    | 1. Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms) by Paula Boddington, November 2017<br>2. Mark Coeckelbergh, " AI Ethics", The MIT Press Essential Knowledge series, April 2020<br>3. Web link:<br>4. <a href="https://sci-hub.mkssa.top/10.1007/978-3-540-30301-5_65">https://sci-hub.mkssa.top/10.1007/978-3-540-30301-5_65</a><br>5. <a href="https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteenchallenges-and-opportunities/">https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteenchallenges-and-opportunities/</a><br>6. <a href="https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/">https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/</a><br>7. <a href="https://sci-hub.mkssa.top/10.1159/000492428">https://sci-hub.mkssa.top/10.1159/000492428</a> |
| <b>MOOC/Web Platforms:</b> | Applied Ethics for AI Swayam-Plus (NPTEL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                         | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand about morality and ethics in AI                                                              | Understand (K2)      |
| <b>CO2</b>                                                | Acquire the knowledge of real time application ethics, issues and its challenges                        | Understand (K2)      |
| <b>CO3</b>                                                | Explain the ethical harms and ethical initiatives in AI                                                 | Understand (K2)      |
| <b>CO4</b>                                                | Apply AI standards and Regulations like AI Agent, Safe Design of Autonomous and Semi-Autonomous Systems | Apply (K3)           |
| <b>CO5</b>                                                | Apply the concepts of Rob ethics and Morality with professional responsibilities                        | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 | PSO-1 | PSO-2 | PSO-3 |
|-------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>CO-1</b> | 3    | 2    | 3    | 3    | 1    | -    | -    | -    | 1    | 2     | 1     | 1     | 3     | 1     | 1     |
| <b>CO-2</b> | 2    | 1    | 1    | 2    | 1    | -    | -    | -    | 1    | 2     | 1     | 1     | 3     | 3     | 1     |
| <b>CO-3</b> | 2    | 3    | 1    | 1    | 3    | -    | -    | -    | 2    | 1     | 1     | 2     | 3     | 2     | 2     |
| <b>CO-4</b> | 3    | 1    | 3    | 3    | 2    | -    | -    | -    | 2    | 2     | 3     | 1     | 2     | 1     | 3     |
| <b>CO-5</b> | 3    | 1    | 1    | 3    | 3    | -    | -    | -    | 2    | 3     | 3     | 3     | 1     | 3     | 3     |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

Chairperson-Board of Studies,   
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**XIV - OPEN ELECTIVES****I - Course Name: 23OCE01 - Cartography and GIS**

| Prerequisite | Program Name                                  | Sem      | Category | L | T | P | C |
|--------------|-----------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - Civil Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                                                           |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand the fundamental elements of cartography including types of maps, map projections, coordinate systems, and their applications.               |
| 2 | To learn the principles of map design, symbolization, color usage, lettering, and the processes involved in map production and reproduction.              |
| 3 | To introduce the basic concepts, components, and data models of Geographic Information Systems (GIS), including spatial and attribute data structures.    |
| 4 | To explore the methods of spatial data input, georeferencing, coordinate transformations, and understand topological relationships in GIS.                |
| 5 | To assess data quality parameters, understand GIS standards and metadata, and learn about spatial data output through maps and graphical representations. |

**III - Course Content**

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                             | ELEMENTS OF CARTOGRAPHY   | 9 Periods |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------|
| Definition of Cartography – Maps – Functions – Uses and Types of Maps – Map Scales and Contents – Map Projections – Shape, Distance, Area and Direction Properties – Perspective and mathematical Projections – Indian Maps and Projections – Map Co-ordinate System – UTM and UPS References.                                                                                                                       |                           |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                            | MAP DESIGN AND PRODUCTION | 9 Periods |
| Map and Mapping concepts -Map Design Fundamentals – Symbols and Conventional Signs – Graded and Ungraded Symbols – Color Theory – Colours and Patterns in Symbolization – Map Lettering – Map Production – Map Printing – Colours and Visualization – Map Reproduction – Map Generalization – Geometric Transformations – Bilinear and Affine Transformations.                                                       |                           |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                           | BASICS OF GIS             | 9 Periods |
| Introduction to GIS – Definitions – History of GIS – Components of a GIS – Hardware, Software, Data, People, Methods – Introduction to data quality – Types of data – Spatial, Attribute data – types of attributes – scales/levels of measurements – spatial data models – Raster Data Structures – Raster Data Compression – Vector Data Structures – Raster Vs Vector Models – TIN and GRID data models.          |                           |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                            | DATA INPUT AND TOPOLOGY   | 9 Periods |
| Scanner – Raster Data Input – Raster Data File Formats – Georeferencing– Vector Data Input – Digitizer– Datum Projection and Reprojection – Coordinate Transformation – Topology - Adjacency, Connectivity and containment – Topological Consistency – Non topological file formats – Attribute Data Linking – Linking External Databases – GPS Data Integration – Raster to Vector and Vector to Raster Conversion. |                           |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                             | DATA QUALITY AND OUTPUT   | 9 Periods |
| Assessment of Data Quality - Basic Aspects - Completeness, Logical Consistency, Positional Accuracy, Temporal Accuracy, Thematic Accuracy and Lineage – Metadata – GIS Standards – Interoperability – OGC - Spatial Data Infrastructure – Data Output – Map Compilation – Chart / Graphs.                                                                                                                            |                           |           |

|                            |                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Arthur H. Robinson et al, "Elements of Cartography", 7th Edition, Wiley, 2002.<br>2. Kang – Tsung Chang, "Introduction to Geographic Information Systems", McGraw Hill Publishing, Fourth Edition, 2017.<br>3. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction to Geographical Information Systems, Pearson Education, Fourth Edition, 2011. |
| <b>Reference Books:</b>    | 1. John Campbell, "Introductory Cartography", Wm. C.BrownPublishers,3rd Edition,2004<br>2. Chor Pang LO, Albert K. W. Yeung, "Concepts and Techniques of Geographic Information Systems", Pearson Education, 2nd Edition, November 2016. ISBN: 9789332581883                                                                                                                 |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.my-mooc.com/en/categorie/gis">https://www.my-mooc.com/en/categorie/gis</a><br><a href="https://www.my-mooc.com/en/mooc/fundamentals-of-gis">https://www.my-mooc.com/en/mooc/fundamentals-of-gis</a>                                                                                                                                                     |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand map types, scales, projections, and coordinate systems used in cartography.        | Understand (K2)      |
| <b>CO2</b>                                                | Apply map design principles, symbolization, and transformation techniques for map production. | Apply (K3)           |
| <b>CO3</b>                                                | Explain GIS components, data types, and spatial data models.                                  | Understand (K2)      |
| <b>CO4</b>                                                | Perform data input, georeferencing, and establish topology in GIS.                            | Apply (K3)           |
| <b>CO5</b>                                                | Assess GIS data quality and generate spatial outputs using standards and metadata.            | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 1   | -   | -   | 3   | -   | -   | -   | -   | 2    | -    | -    | 1    | -    | -    |
| <b>CO2</b>  | 3   | 1   | -   | -   | 3   | -   | -   | -   | -   | 2    | -    | -    | 1    | -    | -    |
| <b>CO3</b>  | 3   | 1   | -   | -   | 3   | -   | -   | -   | -   | 2    | -    | -    | 1    | -    | -    |
| <b>CO4</b>  | 3   | 1   | -   | -   | 3   | -   | -   | -   | -   | 2    | -    | -    | 1    | -    | -    |
| <b>CO5</b>  | 3   | 1   | -   | -   | 3   | -   | -   | -   | -   | 2    | -    | -    | 1    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OCE02 - Environment, Health and Safety

| Prerequisite | Program Name                                  | Sem      | Category | L | T | P | C |
|--------------|-----------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - Civil Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                                    |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand the need for EHS systems in workplaces and interpret international and national EHS regulations, policies, and ergonomics principles |
| 2 | To learn occupational health hazards, exposure pathways, and apply appropriate control measures including personal protective equipment.           |
| 3 | To understand safety features in workplace design and implement safety systems for physical, chemical, and construction-related hazards.           |
| 4 | To be familiarize with workplace hazards, conduct job safety analyses, and develop effective risk management and emergency response plans.         |
| 5 | To understand and apply the components of an EHS management system based on national and international standards like BIS and ISO 45001.           |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                       |                                                   |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                       | <b>INTRODUCTION</b>                               | <b>9 Periods</b> |
| Need for developing Environment, Health and Safety systems in work places- International initiatives, National Policy and Legislations on EHS in India - Regulations and Codes of Practice - Role of trade union safety representatives - Ergonomics.                                                                                                                                                 |                                                   |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                      | <b>OCCUPATIONAL HEALTH AND HYGIENE</b>            | <b>9 Periods</b> |
| Definition of occupational health and hygiene - Categories of health hazards – Exposure pathways and human responses–Exposure Assessment-occupational exposure limits - Hierarchy of control measures - Role of personal protective equipment and the selection criteria.                                                                                                                             |                                                   |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                     | <b>WORKPLACE SAFETY AND SAFETY SYSTEMS</b>        | <b>9 Periods</b> |
| Features of Satisfactory and Safe design of work premises – good housekeeping - Training methods and strategies -types of training. Evaluation and review of training -lighting and color, Ventilation and Heat Control, Noise, Chemical and Radiation Safety – Electrical Safety – Fire Safety – Safety at Construction sites, ETP – Machine guarding – Process Safety, Working at different levels. |                                                   |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                      | <b>HAZARDS AND RISK MANAGEMENT</b>                | <b>9 Periods</b> |
| Safety appraisal – Job Safety Analysis-Control techniques – plant safety inspection – Accident investigation - Analysis and Reporting – Hazard and Risk Management Techniques –Onsite and Offsite emergency Plans. Employee Participation- Education and Training- Case Studies.                                                                                                                      |                                                   |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                       | <b>ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT</b> | <b>9 Periods</b> |
| Concept of Environmental Health and Safety Management – Elements of Environmental Health and Safety Management Policy and implementation and review – Bureau of Indian standards on safety and health 14489 - 1998 and 15001 - ISO 45001-Structure and Clauses-Case Studies.                                                                                                                          |                                                   |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Industrial Health and Safety Acts and Amendments, by Ministry of Labour and Employment, Government of India<br>2. Fundamentals of Industrial Safety and Health by Dr.K.U.Mistry, Siddharth Prakashan, 2012                                                                                                                                                                                                              |
| <b>Reference Books:</b>    | 1. The Facility Manager's Guide to Environmental Health and Safety by Brian Gallant, Government Inst Publ., 2007.<br>2. Effective Environmental, Health, and Safety Management Using the Team Approach by Bill Taylor, Culinary and Hospitality Industry Publications Services, 2005.<br>3. Environmental and Health and Safety Management by Nicholas P.Chermisinoff and Madelyn L. Graffia, William Andrew Inc. NY, 1995 |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.coursera.org/courses?query=environmental%20health">https://www.coursera.org/courses?query=environmental%20health</a><br><a href="https://moocs.anuonline.ac.in/quality-health-safety-environment.html">https://moocs.anuonline.ac.in/quality-health-safety-environment.html</a>                                                                                                                       |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                             | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the need for EHS in industries and related Indian regulations.   | Understand (K2)      |
| <b>CO2</b>                                                | Identify workplace health hazards and apply assessment and control methods. | Understand (K2)      |
| <b>CO3</b>                                                | Analyze safety systems used in industrial environments.                     | Apply (K3)           |
| <b>CO4</b>                                                | Prepare emergency plans and conduct accident investigations.                | Apply (K3)           |
| <b>CO5</b>                                                | Understand EHS Management System and its key elements.                      | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | -   | -   | -   | 1   | 2   | 3   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO2</b>  | 3   | -   | -   | -   | 1   | 2   | 3   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO3</b>  | 3   | -   | -   | -   | 1   | 2   | 3   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO4</b>  | 3   | -   | -   | -   | 1   | 2   | 3   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO5</b>  | 3   | -   | -   | -   | 1   | 2   | 3   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OCE03 - Environment Impact Assessment

| Prerequisite | Program Name                                  | Sem      | Category | L | T | P | C |
|--------------|-----------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - Civil Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                    |
|---|--------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamentals, historical development, and legal aspects of Environmental Impact Assessment (EIA). |
| 2 | To apply methodologies and analytical tools for environmental impact prediction and evaluation.                    |
| 3 | To assess socio-economic impacts of developmental projects on individuals, families, and communities.              |
| 4 | To analyze and propose mitigation measures for impacts on natural, cultural, and economic environments.            |
| 5 | To gain practical insights into EIA through real-world industrial and infrastructure case studies.                 |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                              | INTRODUCTION                          | 9 Periods |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------|
| Historical development of Environmental Impact Assessment (EIA). Environmental Clearance- EIA in project cycle. legal and regulatory aspects in India – types and Methods of categorization of industries for EIA limitations of EIA –EIA process screening – scoping - terms of reference in EIA- setting – analysis mitigation–public hearing in EIA- EIA consultant accreditation. |                                       |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                             | COMPONENTS AND QUALITY ANALYSIS       | 9 Periods |
| Matrices networks – checklists – cost benefit analysis – analysis of alternatives – expert systems in EIA. prediction tools for EIA – mathematical modelling for impact prediction – assessment of impacts – air – water – soil – noise – biological — cumulative impact assessment.                                                                                                  |                                       |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                            | SOCIO-ECONOMIC IMPACT ASSESSMENT      | 9 Periods |
| Socio-economic impact assessment - relationship between social impacts and change in community and institutional arrangements. factors and methodologies- individual and family level impacts communities transition.                                                                                                                                                                 |                                       |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                             | PREDICTION, ASSESSMENT AND MITIGATION | 9 Periods |
| Methods for Prediction and assessment of impacts on Air, Water, Soil and Noise - Biological, Cultural, Social and Economic environments - Standards and guidelines for evaluation - Options for mitigation of impacts - Policies for decision making.                                                                                                                                 |                                       |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                              | CASE STUDIES                          | 9 Periods |
| Mining, power plants, cement plants, highways, petroleum refining industry, storage & handling of hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and construction projects.                                                                                                                                                                          |                                       |           |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Morris, P. and Therivel, R., Environmental Impact Assessment: Theory and Practice, 2nd Edition, Routledge, London, 2021.<br>2. Glasson, J., Therivel, R. and Chadwick, A., Introduction to Environmental Impact Assessment, 5th Edition, Routledge, London, 2019.<br>3. Fonseca, A. (Ed.), Handbook of Environmental Impact Assessment, Edward Elgar Publishing, Cheltenham, 2022.<br>4. Morris, P. and Therivel, R., Methods of Environmental Impact Assessment, 4th Edition, Routledge, London, 2020.<br>5. Gilpin, A. (Ed.), Environmental Impact Assessment: Cutting Edge for the 21st Century, Revised Reprint, Routledge, London, 2020. |
| <b>Reference Books:</b>    | 1. Canter, L.W., Environmental Impact Assessment, 2nd Edition, McGraw-Hill, New York, 1996.<br>2. Lawrence, D.P., Impact Assessment – Practical Solutions to Recurrent Problems and Contemporary Challenges, 2nd Edition, Wiley, New Jersey, 2014.<br>3. Kolluru, R., Bartell, S., Pitblado, R. and Stricoff, R., Risk Assessment and Management Handbook, McGraw-Hill Inc., New York, 1996.                                                                                                                                                                                                                                                     |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc22_ar07/preview">https://onlinecourses.nptel.ac.in/noc22_ar07/preview</a><br><a href="https://www.futurelearn.com/courses/environmental-impact-assessment">https://www.futurelearn.com/courses/environmental-impact-assessment</a><br><a href="https://cursos.iadb.org/en/topics/management-social-and-environmental-risk/principles-reviewing-environmental-impact-assessments">https://cursos.iadb.org/en/topics/management-social-and-environmental-risk/principles-reviewing-environmental-impact-assessments</a>                                                                              |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the principles, process, and regulatory framework of Environmental Impact Assessment. | Understand (K2)      |
| CO2                                                       | Apply analytical methods and prediction tools for assessing environmental impacts.               | Apply (K3)           |
| CO3                                                       | Evaluate socio-economic consequences of developmental projects on communities.                   | Apply (K3)           |
| CO4                                                       | Recommend suitable mitigation measures and policies for sustainable project development.         | Apply (K3)           |
| CO5                                                       | Analyze real-world case studies to integrate theory with practical EIA applications.             | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | -   | -   | -   | -   | 2   | 2   | -   | -   | 2    | -    | -    | -    | -    | -    |
| CO2         | 3   | 2   | 3   | 3   | 2   | -   | -   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO3         | -   | 2   | -   | -   | -   | 3   | 2   | 2   | -   | 2    | -    | -    | -    | -    | -    |
| CO4         | -   | -   | 3   | -   | -   | 3   | 3   | 3   | -   | 3    | 2    | -    | -    | -    | -    |
| CO5         | 3   | -   | 3   | 2   | -   | 2   | 3   | -   | 2   | 3    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

**I - Course Name: 23OCE04 - Industrial Waste Water Management**

| Prerequisite | Program Name                                  | Sem      | Category | L | T | P | C |
|--------------|-----------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - Civil Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                                                            |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the sources, characteristics, and environmental impacts of industrial wastewater.                                                             |
| 2 | To provide knowledge on regulatory requirements and the importance of pollution prevention and waste minimization in industries.                           |
| 3 | To familiarize students with various physical, chemical, and biological treatment methods used in industrial wastewater management.                        |
| 4 | To develop understanding on reuse strategies, residuals management, and zero discharge concepts.                                                           |
| 5 | To enable students to analyze real-life case studies and recommend suitable wastewater treatment and pollution control strategies for specific industries. |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                       |                                                                 |                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                       | <b>INDUSTRIAL WASTEWATER TREATMENT INTRODUCTION</b>             | <b>8 Periods</b>  |
| Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants - Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial                                                                  |                                                                 |                   |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                      | <b>INDUSTRIAL POLLUTION PREVENTION &amp; WASTE MINIMISATION</b> | <b>8 Periods</b>  |
| Prevention vis a vis Control of Industrial Pollution – Benefits and Barriers – Waste management Hierarchy - Source reduction techniques – Periodic Waste Minimization. Methods and materials changes – Waste minimization strategies – Zero discharge concept.                                                                                        |                                                                 |                   |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                     | <b>INDUSTRIAL WASTEWATER TREATMENT</b>                          | <b>10 Periods</b> |
| Flow and Load Equalization – Solids Separation – Removal of Fats, Oil & Grease- Neutralisation- Removal of Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Difficulties and Remedial Measures, Rotating Biological Contactors. Suspended Growth Processes |                                                                 |                   |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                      | <b>WASTEWATER REUSE AND RESIDUAL MANAGEMENT</b>                 | <b>9 Periods</b>  |
| Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse Industrial reuse, Present status and issues. Residuals of industrial wastewater treatments – Individual and common effluent treatment plants.                   |                                                                 |                   |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                       | <b>CASE STUDIES</b>                                             | <b>10 Periods</b> |
| Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Sugar and Distilleries                                                                                                                                |                                                                 |                   |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**Total: 45 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Wastewater Treatment – Concepts and Design Approach, by G L Karia and R A Christian, Prentice Hall of India, 2006<br>2. Environmental Engineering by Gerard Kiely, McGraw Hill Education (India) Pvt Ltd, 2013<br>3. Environmental Engineering – A Design Approach by A. P. Sincero and G A Sincero, Prentice Hall of India, 2014                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Reference Books:</b>    | 1. "Industrial wastewater management, Treatment & disposal, Water Environment" Federation Alexandria Virginia, Third Edition, 2008.<br>2. Lawrence K. Wang, Yung Tse Hung, Howard H. Lo and Constantine Yapijakis "Handbook of Industrial and Hazardous waste Treatment", Second Edition, 2004.<br>3. Metcalf & Eddy, Inc., George Tchobanoglous, Franklin L. Burton and H. David Stensel, Wastewater engineering, treatment and reuse, Fourth Edition, McGraw-Hill, 2017<br>4. Nelson Leonard Nemerow, "Industrial waste Treatment", Elsevier, 2007.<br>5. Wesley Eckenfelder W., "Industrial Water Pollution Control", Second Edition, McGraw Hill, 2000.<br>6. Paul L. Bishop, Pollution Prevention: -Fundamentals and Practice", McGraw Hill International, Boston, 2000.<br>7. Waste water Treatment for pollution control and reuse by Soli. J. Arceivala, Shyam. R. Asolekar, Tata McGraw Hill, 2007 |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc24_ce53/preview">https://onlinecourses.nptel.ac.in/noc24_ce53/preview</a><br><a href="https://nptel.ac.in/courses/105105350">https://nptel.ac.in/courses/105105350</a><br><a href="https://onlinecourses.nptel.ac.in/noc25_ce116/preview">https://onlinecourses.nptel.ac.in/noc25_ce116/preview</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                             | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain the source and types of industrial wastewater and their environmental impacts and choose the regulatory laws pertaining to environmental protection | Understand (K2)      |
| CO2                                                       | Apply industrial wastewater pollution and implement pollution prevention, waste minimization in industries                                                  | Apply (K3)           |
| CO3                                                       | Apply knowledge and skills to design industrial wastewater treatment schemes                                                                                | Apply (K3)           |
| CO4                                                       | Analyze environmental performance of industries to internal, external client, regulatory bodies and design water reuse management techniques                | Analyze (K4)         |
| CO5                                                       | Apply research to develop effective management systems for industrial wastewater that are technically sound, economically feasible and socially acceptable  | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | -   | -   | -   | 3   | 2   | 2   | -   | -    | -    | 2    | -    | -    | -    |
| CO2         | 3   | 2   | 3   | 2   | 2   | 2   | 2   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO3         | 3   | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -    | -    | 3    | -    | -    | -    |
| CO4         | 3   | 2   | 3   | 3   | 3   | 3   | 2   | -   | -   | -    | -    | 3    | -    | -    | -    |
| CO5         | 3   | 3   | 3   | 3   | 3   | 3   | 2   | -   | -   | -    | -    | 3    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)



## I - Course Name: 23OCE05 - Remote Sensing Concepts

| Prerequisite | Program Name                                  | Sem      | Category | L | T | P | C |
|--------------|-----------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - Civil Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                          |
|---|--------------------------------------------------------------------------------------------------------------------------|
| 1 | To help students understand the basic concepts and components of remote sensing, including the principles of radiation.  |
| 2 | To understand how electromagnetic radiation interacts with the Earth's surface and atmosphere.                           |
| 3 | To learn about different satellite orbits, types of platforms, and the applications of nano-satellites.                  |
| 4 | To understand how various remote sensors work and their characteristics.                                                 |
| 5 | To learn how to use satellite data, interpret images, and apply cloud-based tools like Google Earth Engine for analysis. |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | REMOTE SENSING AND ELECTROMAGNETIC RADIATION       | 9 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------|
| Definition – components of Remote Sensing – History of Remote Sensing – Merits and demerits of data collation between conventional and remote sensing methods – Electromagnetic Spectrum – Radiation principles – Wave theory, Planck's law, Wien's Displacement Law, Stefan's Boltzmann law, Kirchoff's law – Radiation sources: active & passive – Radiation Quantities                                                                                                                                                                       |                                                    |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL | 9 Periods |
| Standard atmospheric profile – Main atmospheric regions and their characteristics – Interaction of radiation with atmosphere – Scattering, absorption and refraction – Atmospheric windows – Energy balance equation – Specular and diffuse reflectors – Spectral reflectance & emittance – Spectroradiometer – Spectral Signature concepts – Typical spectral reflectance curves for vegetation, soil, and water – Solid surface scattering in microwave region – Introduction to drone-based hyperspectral remote sensing and thermal mapping |                                                    |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ORBITS AND PLATFORMS                               | 9 Periods |
| Motions of planets and satellites – Newton's law of gravitation – Gravitational field and potential – Escape velocity – Kepler's laws of planetary motion – Orbit elements and types – Orbital perturbations and maneuvers – Types of remote sensing platforms – Ground-based, airborne, and spaceborne platforms – Classification of satellites – Sun-synchronous and geosynchronous satellites – Lagrange orbit – Latest nano-satellite applications                                                                                          |                                                    |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SENSING TECHNIQUES                                 | 9 Periods |
| Classification of remote sensors – Resolution concept: spatial, spectral, radiometric and temporal resolutions - Scanners - Along and across track scanners – Optical-infrared sensors – Thermal sensors – microwave sensors – Calibration of sensors - High Resolution Sensors - LIDAR, UAV – Orbital and sensor characteristics of live Indian earth observation satellites                                                                                                                                                                   |                                                    |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | DATA PRODUCTS AND INTERPRETATION                   | 9 Periods |
| Photographic and digital products – Types, levels and open source satellite data products – selection and procurement of data– Visual interpretation: basic elements and interpretation keys -Digital interpretation – Concepts of Image rectification, Image enhancement and Image classification - Cloud-based access (Google Earth Engine), and real-time analytics tools                                                                                                                                                                    |                                                    |           |



|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | 1. Thomas M.Lillesand, Ralph W. Kiefer and Jonathan W. Chipman, Remote Sensing and Image interpretation, John Wiley and Sons, Inc, New York,2015.<br>2. George Joseph and C Jeganathan, Fundamentals of Remote Sensing,Third Edition Universities Press (India) Private limited, Hyderabad, 2018                                                                                                                                        |
| <b>Reference Books:</b> | 1. Janza, F.Z., Blue H.M. and Johnson,J.E. Manual of Remote Sensing. Vol.I, American Society of Photogrametry, Virginia, USA, 2002.<br>2. Verbyla, David, Satellite Remote Sensing of Natural Resources. CRC Press, 1995<br>3. Paul Curran P.J. Principles of Remote Sensing. Longman, RLBS, 1988.<br>4. Introduction to Physics and Techniques of Remote Sensing, Charles Elachi and Jacob Van Zyl, 2006 Edition II, Wiley Publication |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the basic concepts, components, and radiation principles of remote sensing.                    | Understand (K2)      |
| CO2                                                       | Understand how electromagnetic radiation interacts with the atmosphere and Earth's surface materials.     | Understand (K2)      |
| CO3                                                       | Understand satellite orbits, different types of platforms, and nano-satellite applications.               | Understand (K2)      |
| CO4                                                       | Understand the working of different remote sensors and their characteristics.                             | Understand (K2)      |
| CO5                                                       | Understand satellite data types, interpretation methods, and use of cloud tools like Google Earth Engine. | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 1   | -   | 1   | 1   | 1   | 1   | -   | -   | -    | -    | 1    | 1    | -    | -    |
| CO2         | 3   | 1   | -   | 1   | 1   | 1   | 1   | -   | -   | -    | -    | 1    | 1    | -    | -    |
| CO3         | 3   | 1   | -   | 1   | 1   | 1   | 1   | -   | -   | -    | -    | 1    | 1    | -    | -    |
| CO4         | 3   | 1   | -   | 1   | 1   | 1   | 1   | -   | -   | -    | -    | 1    | 1    | -    | -    |
| CO5         | 3   | 1   | -   | 1   | 1   | 1   | 1   | -   | -   | -    | -    | 1    | 1    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OEC01 - Antenna Fundamentals

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - ECE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                        |
|---|--------------------------------------------------------------------------------------------------------|
| 1 | Understand and analyze key antenna parameters and matching techniques to evaluate antenna performance. |
| 2 | Design and analyze linear and phased antenna arrays for directional radiation control                  |
| 3 | Learn techniques for accurate measurement of antenna parameters and overcome practical limitations.    |
| 4 | Explore the principles and applications of frequency-independent and modern specialized antennas.      |
| 5 | Understand antenna requirements and designs for contemporary wireless, satellite, and radar systems.   |

## III - Course Content

|                                                                                                                                                                                                                                                                                 |                                                    |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                 | <b>ANTENNA FUNDAMENTALS AND RADIATION</b>          | <b>9 Periods</b> |
| Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature.                                                                   |                                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                | <b>ANTENNA ARRAYS</b>                              | <b>9 Periods</b> |
| N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array.                                                                                                                                                        |                                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                               | <b>ANTENNA MEASUREMENTS</b>                        | <b>9 Periods</b> |
| Drawbacks in measurement of antenna parameters – methods to overcome drawbacks in antenna measurements - measurement ranges - Impedance - Gain - Radiation pattern - Beam width, Radiation resistance - Antenna efficiency - Directivity - Polarization and phase Measurements. |                                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                | <b>SPECIAL ANTENNAS</b>                            | <b>9 Periods</b> |
| Principle of frequency independent antennas – Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Reflector Antenna, Patch Antenna.                                                                                                         |                                                    |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                 | <b>ANTENNAS FOR MODERN WIRELESS COMMUNICATIONS</b> | <b>9 Periods</b> |
| Antennas for Terrestrial mobile communication - mobile handsets and base stations. Antennas for Satellite Communication, Radar systems, RFID, MEMS antenna, MIMO antenna.                                                                                                       |                                                    |                  |

Total: 45 Periods

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b> | <ol style="list-style-type: none"> <li>1. John D Kraus, "Antennas for all Applications", McGraw Hill, 5th Edition, 2005. R.E. Collin, "Antennas and Radio wave propagation", McGraw Hill, 1985.</li> <li>2. Constantine. A. Balanis, "Antenna Theory Analysis and Design", Wiley student edition, 3rd Edition, 2009.</li> <li>3. Annapurna Das and Sisir K Das, Microwave Engineering, Tata McGraw Hill Publishing Company Ltd., New Delhi, Second Edition, 2009</li> <li>4. Edward C. Jordan and Keith G. Balmain, "Electromagnetic Waves and Radiating Systems", Prentice Hall of India, 2006</li> <li>5. S. Drabowitch, "Modern Antennas", Springer Publications, 2nd Edition, 2007</li> <li>6. Robert S. Elliott, "Antenna theory and Design", Wiley student edition, 2010.</li> <li>7. H. Sizon, "Radio Wave Propagation for Telecommunication Applications", First Indian Reprint, Springer Publications, 2007</li> </ol> |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                   | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Comprehend antenna parameters and the radiation mechanism of simple antennas to complex antenna structures.       | Understand (K2)      |
| CO2                                                       | Design antennas for given specifications and perform array synthesis.                                             | Apply (K3)           |
| CO3                                                       | Elaborate the radiation mechanism of aperture antennas.                                                           | Understand (K2)      |
| CO4                                                       | Acquire knowledge on the operation of antennas designed for specific applications and the measurement procedures. | Understand (K2)      |
| CO5                                                       | Explain the selection of modern antennas for various applications.                                                | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO2         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO3         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO4         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO5         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OEC02 - Consumer Electronics

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - ECE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                                                                           |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To provide foundational knowledge of the consumer electronics industry, including classification of products, key components, ergonomic design principles, and power supply technologies. |
| 2 | To understand the working principles and technologies behind modern audio and video systems, including analog/digital formats, display technologies, and streaming media platforms.       |
| 3 | To explore the internal architecture and control systems of household appliances, and introduce smart home integration with voice-controlled and energy-efficient technologies            |
| 4 | To examine the role of IoT architecture, wireless communication protocols, and AI/ML in enhancing functionality, connectivity, and intelligence of modern consumer devices.               |
| 5 | To impart practical knowledge on safety standards, maintenance, fault diagnosis, and to introduce emerging innovations and sustainable practices in consumer electronics.                 |

## III - Course Content

|                                                                                                                                                                                                                                                     |                                                          |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                     | <b>INTRODUCTION TO CONSUMER ELECTRONICS</b>              | <b>9 Periods</b> |
| Overview of consumer electronics industry- Classification: audio-video-communication-home appliances- Key components and block diagrams-Power supplies and batteries- Ergonomics and design aspects.                                                |                                                          |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                    | <b>AUDIO AND VIDEO SYSTEMS</b>                           | <b>9 Periods</b> |
| Microphones-loudspeakers-amplifiers Analog and digital audio systems-Smart TVs-OLED-QLED-Set-top boxes, IPTV, streaming systems- Digital cameras, camcorders- imaging technologies.                                                                 |                                                          |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                   | <b>HOME AND SMART APPLIANCES</b>                         | <b>9 Periods</b> |
| Washing machines-microwave ovens- air conditioners-refrigerators-Embedded control systems in appliances-Energy efficiency and inverter technology-Introduction to Smart Homes and connected devices-Voice assistants-Amazon Alexa-Google Assistant. |                                                          |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                    | <b>IOT, AI AND COMMUNICATION IN CONSUMER ELECTRONICS</b> | <b>9 Periods</b> |
| IoT architecture and sensors in consumer devices-Wireless standards: Wi-Fi, Zigbee- Bluetooth-NFC AI and ML applications in consumer products- Smartphone technologies and wearable devices- Security-privacy and interoperability.                 |                                                          |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                     | <b>TROUBLESHOOTING, MAINTENANCE AND EMERGING TRENDS</b>  | <b>9 Periods</b> |
| Safety standards, regulations (BIS, IEC, RoHS)-Installation and maintenance practices-Fault diagnosis techniques-E-waste management and green electronics-Emerging trends: foldable tech- 8K- AR/VR-sustainable devices.                            |                                                          |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods



|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b> | 1.S.P. Bali, "Consumer Electronics", Pearson Education, 2nd Edition, 2010.<br>2.R.G. Gupta, "Audio and Video Systems", Tata McGraw-Hill, 2nd Edition, 2010.<br>3.N.P. Bhatt, "Consumer Electronics: Servicing and Maintenance", McGraw Hill, 2nd Edition, 2010.<br>4.Robert Sobot, "Wireless Communication Electronics: Introduction to RF Circuits and Design", Springer, 2nd Edition, 2021.<br>5.Dogan Ibrahim, "Internet of Things with PIC Microcontrollers", Newnes, 1st Edition, 2020 |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## IV – Course Outcomes

| On completion of the course, the students will be able to |                                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the principles and features of audio and video systems used in consumer electronics.        | Understand (K2)      |
| CO2                                                       | Explain the operation of home appliances and their subsystems.                                         | Understand (K2)      |
| CO3                                                       | Demonstrate knowledge of digital and smart consumer devices, including IoT-enabled products.           | Apply (K3)           |
| CO4                                                       | Apply safety, troubleshooting, and maintenance procedures for consumer electronics.                    | Apply (K3)           |
| CO5                                                       | Enumerate emerging trends and technologies such as AI, ML, and sustainability in consumer electronics. | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO2         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO3         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO4         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO5         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OEC03 Display Devices Fundamentals

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - ECE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                 |
|---|---------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand the fundamental principles of display systems, human visual perception, and key display parameters.               |
| 2 | To explore the structure, operation, and applications of transmissive and reflective displays including LCDs and e-paper.       |
| 3 | To study emissive and projection display technologies such as OLED, QLED, CRT, and various projection systems.                  |
| 4 | To examine near-eye and wearable displays including AR/VR systems, holographic optics, and eye-tracking mechanisms.             |
| 5 | To analyze advanced and 3D display technologies including light field, volumetric, autostereoscopic, and touch screen displays. |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                  | DISPLAY FUNDAMENTALS                   | 9 Periods |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------|
| Introduction to Displays, Requirements of Displays, Overview of Display Technologies: CRT, Flat Panel, Advanced Displays, Cathode Ray Tube (CRT), Flat Panel Displays, Human Visual System, Colorimetry, Depth Perception and Motion Perception Fundamentals, Fundamental Display Parameters.             |                                        |           |
| Unit – II                                                                                                                                                                                                                                                                                                 | TRANSMISSIVE AND REFLECTIVE DISPLAYS   | 9 Periods |
| Introduction to transmissive Displays, Liquid Crystal Display (LCD), Types of LCD, LED Backlighting in LCDs, Reflective Displays, Electronic Paper (E-Ink), Digital Micromirror Device (DMD), Electrowetting and Electrofluidic Displays, Practical applications of Transmissive and Reflective Displays. |                                        |           |
| Unit – III                                                                                                                                                                                                                                                                                                | EMISSIVE AND PROJECTION DISPLAYS       | 9 Periods |
| Emissive Displays, Cathode Ray Tube (CRT), OLED and AMOLED Displays, Quantum Dot LEDs (QLED), Field Emission Displays, Projection Display, Types of Projectors, Holographic Projection, Common Applications of Emissive and Projection Displays.                                                          |                                        |           |
| Unit – IV                                                                                                                                                                                                                                                                                                 | NEAR-EYE AND WEARABLE DISPLAYS         | 9 Periods |
| Near-Eye Displays (NED), Head-Mounted Displays (HMD), Combiner Mirrors and Basic Optical Principles, On-Axis and Off-Axis Near-Eye Displays, Smart NEDs and Augmented Reality, Light Field Displays and Holographic NEDs, Contact Lens Displays, Adaptive Displays, Eye Tracking:                         |                                        |           |
| Unit – V                                                                                                                                                                                                                                                                                                  | ADVANCED DISPLAY TYPES AND 3D DISPLAYS | 9 Periods |
| Introduction to 3D Displays and Their Significance, Spatial and Spectroscopic Displays, Autostereoscopic Displays, Parallax Barrier Displays, Volumetric Displays, Light Field Display, Computer-Generated Holograms (CGH), HDTV and LED Displays, Touch Screen Displays.                                 |                                        |           |

Total: 45 Periods

|                  |                                                                                                                                                                                                                                                                                                                                                                     |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference Books: | 1. R G Gupta, Television Engineering and Video Systems, McGraw Hill, India, 2011 (Second Edition).<br>2. A Veeralakshmi and R Srivel, "Television and Video Engineering", Ane Books, 2013.<br>3. E.H. Stupp, M. S. Brennesholtz, "Projection Displays", Wiley, 2008 (Second Edition).<br>4. Joseph A. Castellano, "Handbook of Display Technology", Elsevier, 1992. |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                      | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand and explain the fundamental principles and requirements of various display technologies including CRT, flat panel, and advanced displays. | Understand (K2)      |
| CO2                                                       | Describe the human visual system and its impact on display design, including concepts of colorimetry, depth perception, and motion perception.       | Understand (K2)      |
| CO3                                                       | Differentiate transmissive and reflective display technologies such as LCD, E-Ink, DMD, and their practical applications.                            | Understand (K2)      |
| CO4                                                       | Explain the working principles and applications of emissive and projection displays, including OLED, AMOLED, QLED, and holographic projectors.       | Understand (K2)      |
| CO5                                                       | Understand near-eye and wearable displays, advanced 3D display technologies, and their significance in modern electronic systems.                    | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO2         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO3         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO4         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO5         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OEC04 - Basics of Embedded Systems

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - ECE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                |
|---|--------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamentals of embedded systems and the architecture, programming, and features of the 8051 microcontroller. |
| 2 | To understand ARM processor architecture, programming, exceptions, and performance analysis techniques.                        |
| 3 | To study the architecture and functionalities of the MSP430 microcontroller and its peripheral interfaces.                     |
| 4 | To explore real-time operating systems, task scheduling, interprocess communication, and multiprocessing in embedded systems.  |
| 5 | To analyze embedded system design through real-world applications like vending machines, digital cameras, and USB interfaces.  |

## III - Course Content

|                                                                                                                                                                                                                                                     |                                                             |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                     | <b>INTRODUCTION TO EMBEDDED SYSTEMS AND MICROCONTROLLER</b> | <b>9 Periods</b> |
| Introduction to Embedded Systems –Structural units in Embedded processor - selection of processor –8/16 bit Microprocessors – Microcontroller for an Embedded System- 8051 Microcontroller – Architecture, Addressing Modes, Instruction Set.       |                                                             |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                    | <b>ARM PROCESSOR</b>                                        | <b>9 Periods</b> |
| ARM Processor – Instruction Set Preliminaries – CPU – Programming Input and Output – Supervisor Mode – Exceptions and Trap – Models for programs – Assembly, Linking and Loading – Compilation Techniques – Program Level Performance Analysis.     |                                                             |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                   | <b>MSP430 MICROCONTROLLER</b>                               | <b>9 Periods</b> |
| Functional Block diagram of MSP-EXP430F5529LP - Memory Mapped CPU, Exceptions, Architecture of MSP430 - Addressing Modes - Instruction Set, Interrupts, Digital in - outs, Timer, Communication interfaces.                                         |                                                             |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                    | <b>PROCESSES AND OPERATING SYSTEMS</b>                      | <b>9 Periods</b> |
| Structure of a real time system, Task Assignment and Scheduling, Multiple Tasks and Multiple Processes, Pre-emptive real time Operating systems, Priority based scheduling, Distributed Embedded Systems, MPSoCs and shared memory multiprocessors. |                                                             |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                     | <b>EMBEDDED SYSTEM APPLICATIONS</b>                         | <b>9 Periods</b> |
| Embedded System Design Process – Model train controller, Chocolate Vending Machine, Digital camera, ATM machine and simple USB back channel.                                                                                                        |                                                             |                  |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                         |                                                                                                                                                   |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b> | 1. The 8051 Microcontroller: Architecture, Programming, and Applications, Kenneth Ayala, West Publishing Company, 2007 (Unit – I)                 |
|                         | 2. Marilyn Wolf, Computers as Components – Principles of Embedded Computing System Design, 3rd Edition, Morgan Kaufmann, 2012. (Unit – II, IV, V) |
|                         | 3. John H Davies, MSP430 Microcontroller Basics, Elsevier, 2008. Unit – III, V).                                                                  |
|                         | 4. Raj Kamal, 'Embedded System-Architecture, Programming, Design', Mc Graw Hill, 2013.                                                            |
|                         | 5. Lyla B.Das, Embedded Systems: An Integrated Approach, Pearson Education, 2013.                                                                 |
|                         | 6. Jane.W.S .Liu, Real – Time Systems, Pearson Education, 2003                                                                                    |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                     | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the architecture and features of 8051.                      | Understand (K2)      |
| <b>CO2</b>                                                | Explain ARM processor architecture and programming concepts.        | Understand (K2)      |
| <b>CO3</b>                                                | Explain MSP430 microcontroller's concepts.                          | Understand (K2)      |
| <b>CO4</b>                                                | Understand the principles of real-time operating systems.           | Understand (K2)      |
| <b>CO5</b>                                                | Apply embedded systems programming, design, and development skills. | Apply (K3)           |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO5</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson, Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OEC05 - Basics of Nano Electronics

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - ECE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                               |
|---|-------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamental concepts of nanoelectronics, including quantum effects, nanostructures, and material properties. |
| 2 | To explore bottom-up synthesis techniques for nanomaterials such as sol-gel, CVD, epitaxy, and self-assembly.                 |
| 3 | To study top-down nanofabrication methods including lithography, ball milling, and vapor phase deposition techniques.         |
| 4 | To understand various characterization techniques for nanomaterials including microscopy and spectroscopy tools.              |
| 5 | To examine the applications of nanoelectronics in MEMS/NEMS, healthcare, energy, electronics, and transportation sectors.     |

## III - Course Content

|                                                                                                                                                                                                                                                                                                     |                                                    |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------|
| Unit – I                                                                                                                                                                                                                                                                                            | INTRODUCTION TO NANO ELECTRONICS                   | 9 Periods |
| Nano electronics in recent scenario - Crystal Structure –Semiconductors- Band theory– Donors - Acceptors and Deep traps, Mobility – Excitons, Electron confinement - Quantum dots, wires and well, 1D, 2D and 3D Nano structured materials, metal Oxides- Physical, Chemical and Optical properties |                                                    |           |
| Unit – II                                                                                                                                                                                                                                                                                           | SYNTHESIS OF NANO MATERIALS - BOTTOM-UP APPROACHES | 9 Periods |
| Sol-gel, Self-assembled monolayer, Physical and Chemical vapour deposition, thin films, epitaxy- Lithography Top-down Approaches-Grinding, high energy ball milling, Injection molding                                                                                                              |                                                    |           |
| Unit – III                                                                                                                                                                                                                                                                                          | NANO MATERIALS - TOP-DOWN APPROACHES               | 9 Periods |
| Fundamentals of nano–thin film growth; Vapor phase deposition methods - Physical and chemical vapor phase methods; Langmuir-Blodgett Films; Electrochemical Deposition; laws of electrolysis and deposition                                                                                         |                                                    |           |
| Unit – IV                                                                                                                                                                                                                                                                                           | NANO MATERIALS CHARACTERIZATION                    | 9 Periods |
| X-ray diffraction, Powder diffraction, Structural analysis, Scanning Electron Microscopy, FESEM, AFM, Transmission Electron Microscope, Spectroscopic techniques: UV-Visible, Infra-red Spectroscopy, rotational, vibrational photo luminescence (PL)                                               |                                                    |           |
| Unit – V                                                                                                                                                                                                                                                                                            | APPLICATIONS OF NANO ELECTRONICS                   | 9 Periods |
| Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS), Application in Electronics, Medical and Health Care, energy saving and for Transportation                                                                                                                          |                                                    |           |

Total: 45 Periods

|                  |                                                                                                                                                                                                                                                                                                                             |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference Books: | 1.Hanson, Fundamentals of Nanoelectronics, Pearson education, 2009<br>2.Mircea Dragoman and Daniela Dragoman, Nanoelectronics: Principles and Devices, Artech House, 2009<br>3.Robert Puers, Livio Baldi, Marcel Van de Voorde and Sebastiaan E. Van Nooten, Nanoelectronics: Materials, Devices, Applications, Wiley, 2017 |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401



## IV - Course Outcome

| On completion of the course, the students will be able to |                                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the basics of nano electronics including quantum wires, dots and wells. | Understand (K2)      |
| CO2                                                       | Explain the bottom-up approaches to synthesize the nano materials.                 | Understand (K2)      |
| CO3                                                       | Explain the top-down approaches to synthesize the nano materials.                  | Understand (K2)      |
| CO4                                                       | Identify the nano material characterization method.                                | Apply (K3)           |
| CO5                                                       | Explain the use of nano devices for various applications.                          | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO2         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO3         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO4         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO5         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23OEC06 - Fundamentals of Image Processing**

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - ECE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                                                |
|---|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the basic concepts, components, and fundamental steps in digital image processing including image acquisition and representation. |
| 2 | To understand image enhancement techniques in the spatial domain using histogram operations and various spatial filters.                       |
| 3 | To apply frequency domain techniques for image enhancement and restoration using Fourier transforms and noise reduction filters.               |
| 4 | To study color image processing, edge detection, and image segmentation methods for feature isolation and analysis.                            |
| 5 | To explore image and video compression techniques and introduce basic feature extraction and pattern recognition methods.                      |

**III - Course Content**

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                             | INTRODUCTION TO IMAGE PROCESSING          | 9 Periods |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------|
| Fundamental Steps in Digital Image Processing, Components of Image Processing System Image Acquisition and Sampling Quantization and Resolution.<br><b>Digital Image Fundamentals</b> - Image Representation (2D functions, pixels) Image Types (Binary, Grayscale, Color), Basic Relationships between Pixels, Neighbors, Connectivity, Distance Metrics. Image File Formats (JPEG, PNG, BMP, TIFF) |                                           |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                            | IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN   | 9 Periods |
| Histogram Processing, Histogram Equalization, Matching, Spatial Filtering Smoothing Filters (Mean, Gaussian), Sharpening Filters (Laplacian, Sobel)                                                                                                                                                                                                                                                  |                                           |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                           | IMAGE ENHANCEMENT IN THE FREQUENCY DOMAIN | 9 Periods |
| Fourier Transform and its Properties, Discrete Fourier Transform (DFT), Filtering in Frequency Domain, Ideal, Butterworth, Gaussian Filters, High-pass and Low-pass Filtering.<br><b>Image Restoration</b><br>Model of Image Degradation/Restoration, Noise Models (Gaussian, Salt & Pepper, Speckle), Restoration Techniques, Inverse Filtering, Wiener Filtering.                                  |                                           |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                            | COLOR IMAGE PROCESSING                    | 9 Periods |
| Color Models (RGB, CMY, HSV, HSI), Color Transformations, Pseudocolor Image Processing, Full-color Image Processing Color Image Smoothing and Sharpening.<br><b>Image Segmentation</b> - Point, Line, and Edge Detection, Roberts, Prewitt, Sobel, Canny Thresholding (Global, Adaptive), Region-based Segmentation, Watershed Segmentation                                                          |                                           |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                             | IMAGE COMPRESSION                         | 9 Periods |
| Need for Compression, Lossless Compression Techniques (Huffman, Run-length), Lossy Compression Techniques (JPEG, Transform Coding), Basics of Video Compression (MPEG)<br>Feature Extraction (SIFT, SURF, HOG), Pattern Recognition Basics                                                                                                                                                           |                                           |           |

**Total: 45 Periods**

|                         |                                                                                                                                                                                       |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b> | 1.Rafael C. Gonzalez and Richard E. Woods, " Digital Image Processing", Pearson Education, 4th Edition<br>2.Anil K. Jain, " Fundamentals of Digital Image Processing", Prentice Hall. |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                             | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the fundamentals of digital images and image processing systems. | Understand (K2)      |
| CO2                                                       | Apply spatial and frequency domain techniques for image enhancement.        | Apply (K3)           |
| CO3                                                       | Analyze and implement image restoration and noise reduction techniques.     | Analyze (K4)         |
| CO4                                                       | Perform color image processing and understand color model.                  | Apply (K3)           |
| CO5                                                       | Understand and apply image compression methods.                             | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO2         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO3         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO4         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO5         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OEC07 - Internet of Things

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - ECE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                           |
|---|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand the evolution, architectures, and core functional stack of the Internet of Things including fog, edge, and cloud computing. |
| 2 | To explore the key components of an IoT ecosystem such as sensors, actuators, control units, and communication modules.                   |
| 3 | To study IoT protocols, wireless sensor networks, and enabling technologies including big data and cloud computing.                       |
| 4 | To learn IoT deployment and programming on platforms like Raspberry Pi and Arduino, including interfacing and cloud connectivity.         |
| 5 | To analyze various IoT applications across smart cities, industry, health, environment, agriculture, and home automation.                 |

## III - Course Content

|                                                                                                                                                                                                                                   |                                              |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                   | <b>INTRODUCTION TO INTERNET OF THINGS</b>    | <b>9 Periods</b> |
| Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT Models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT. |                                              |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                  | <b>COMPONENTS IN INTERNET OF THINGS</b>      | <b>9 Periods</b> |
| Functional Blocks of an IoT Ecosystem – Sensors, Actuators, and Smart Objects – Control Units - Communication modules (Bluetooth, Zigbee, Wifi, GPS, GSM Modules).                                                                |                                              |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                 | <b>PROTOCOLS AND TECHNOLOGIES BEHIND IoT</b> | <b>9 Periods</b> |
| IoT Protocols - IPv6, 6LoWPAN, MQTT, CoAP - RFID, Wireless Sensor Networks, Big Data Analytics, Cloud Computing, Embedded Systems.                                                                                                |                                              |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                  | <b>OPEN PLATFORMS AND PROGRAMMING</b>        | <b>9 Periods</b> |
| IoT deployment for Raspberry Pi /Arduino platform-Architecture –Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.                                        |                                              |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                   | <b>IoT APPLICATIONS</b>                      | <b>9 Periods</b> |
| Business models for the internet of things, Smart city, Smart mobility and transport, Industrial IoT, Smart health, Environment monitoring and surveillance – Home Automation – Smart Agriculture.                                |                                              |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b> | <ol style="list-style-type: none"> <li>1. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017</li> <li>2. Samuel Greengard, The Internet of Things, The MIT Press, 2015.</li> <li>3. Perry Lea, "Internet of things for architects", Packt, 2018.</li> <li>4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.</li> <li>5. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.</li> <li>6. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.</li> <li>7. ArshdeepBahga, Vijay Madiseti, "Internet of Things – A hands-on approach", Universities Press, 2015</li> </ol> |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain the concept of IoT.                                        | Understand (K2)      |
| <b>CO2</b>                                                | Understand the communication models and various protocols for IoT. | Understand (K2)      |
| <b>CO3</b>                                                | Design portable IoT using Arduino/Raspberry Pi /open platform.     | Understand (K2)      |
| <b>CO4</b>                                                | Apply data analytics and use cloud offerings related to IoT.       | Apply (K3)           |
| <b>CO5</b>                                                | Explain applications of IoT in real time scenario.                 | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO5</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401



## I - Course Name: 23OEC08 - Sensors and Actuators

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - ECE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                     |
|---|-------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand sensor functions, classifications, calibration methods, and principles of transduction with error analysis.           |
| 2 | To study the principles, construction, and applications of variable resistance and inductance sensors like strain gauges and LVDTs. |
| 3 | To explore variable capacitance sensors, piezoelectric, Hall effect, semiconductor sensors, and environmental sensors.              |
| 4 | To examine various automotive actuators including electromechanical and fluid-mechanical types and their machine ratings.           |
| 5 | To analyze different actuators used in automatic temperature control systems and their operational characteristics.                 |

## III - Course Content

|                                                                                                                                                                                                                                                                                                |                                                  |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                | <b>INTRODUCTION TO MEASUREMENTS AND SENSORS</b>  | <b>9 Periods</b> |
| Sensors: Functions- Classifications- Main technical requirement and trends Units and standards Calibration methods- Classification of errors- Error analysis- Limiting error- Probable error Propagation of error- Odds and uncertainty- principle of transduction-Classification.             |                                                  |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                               | <b>VARIABLE RESISTANCE AND INDUTANCE SENSORS</b> | <b>9 Periods</b> |
| Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors Inductive potentiometer and LVDT.                                                                        |                                                  |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                              | <b>VARIABLE AND OTHER SPECIAL SENSORS</b>        | <b>9 Periods</b> |
| Variable Resistance Sensors, Variable Capacitance and variable permittivity type- capacitor microphone Piezoelectric, Magnetostrictive, Hall Effect, semiconductor sensor- digital transducers-Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor. |                                                  |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                               | <b>AUTOMOTIVE ACTUATORS</b>                      | <b>9 Periods</b> |
| Electromechanical actuators - Fluid - mechanical actuators - Electrical machines - Direct - current machines - Three - phase machines - Single - phase alternating - current Machines - Duty - type ratings for electrical machines.                                                           |                                                  |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                | <b>AUTOMATIC TEMPERATURE CONTROL ACTUATORS</b>   | <b>9 Periods</b> |
| Different types of actuators used in automatic temperature control - Fixed and variable displacement temperature control                                                                                                                                                                       |                                                  |                  |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b> | 1. Ernest O. Doebelin, Dhanesh N.Manik Doebelin's Measurement Systems: 7th Edition (SIE), McGraw Hill Publishers, 2019.<br>2. Robert Brandy, "Automotive Electronics and Computer System", Prentice Hall, 2001<br>3. William Kimberley, "Bosch Automotive Handbook", 6th Edition, Robert Bosch GmbH, 2004.<br>4. Bosch Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive, 5th Edition, 2007, ISBN No: 978 - 3 - 658 - 01783 - 5.<br>5. James D Halderman, "Automotive Electrical and Electronics", Prentice Hall, USA, 2013<br>6. Tom Denton, "Automotive Electrical and Electronics Systems," Third Edition, 2004, SAE International.<br>7. Patranabis.D, "Sensors and Transducers", 2nd Edition, Prentice Hall India Ltd, 2003<br>8. William Ribbens, "Understanding Automotive Electronics - An Engineering Perspective", 7th Edition, Elsevier Butterworth - Heinemann Publishers, 2012. |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | List common types of sensor and actuators used in vehicles.                               | Understand (K2)      |
| <b>CO2</b>                                                | Design measuring equipment's for the measurement of pressure force, temperature and flow. | Apply (K3)           |
| <b>CO3</b>                                                | Generate new ideas in designing the sensors and actuators for automotive application.     | Apply (K3)           |
| <b>CO4</b>                                                | Understand the operation of the sensors, actuators and electronic control.                | Understand (K2)      |
| <b>CO5</b>                                                | Explain temperature control actuators for vehicles.                                       | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO5</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23OEC09 - Wearable Devices and its Applications**

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - ECE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                           |
|---|---------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce wearable devices, their evolution, types, sensors, applications, and industry trends.                        |
| 2 | To understand physiological and motion data, basic wearable sensors, biological signals, and user interaction techniques. |
| 3 | To explore wireless health systems, body area networks, integration with smartphones/cloud, and security concerns.        |
| 4 | To study wearable applications in healthcare, fitness, rehabilitation, and assistive technologies for special needs.      |
| 5 | To examine wearable technology in defense, environmental monitoring, smart lifestyles, and advanced wearable robotics.    |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                            |                                                              |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                            | <b>INTRODUCTION TO WEARABLE DEVICES</b>                      | <b>9 Periods</b> |
| Introduction to wearable devices – Evolution of wearable computing – Types of wearable devices: Smart watches, Fitness trackers, Smart garments, AR/VR devices – Basic classification of wearable sensors – Applications in healthcare, sports, education, safety, and entertainment – Overview of industry trends and future scope.                                                       |                                                              |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>WEARABLE DATA AND USER INTERFACE</b>                      | <b>9 Periods</b> |
| Physiological and motion data: heart rate, steps, sleep, temperature – Introduction to basic sensors: Accelerometers, Gyroscopes – Overview of biological signals: ECG, EEG, EMG – Data visualization techniques – User interaction: Haptic feedback, Gesture and Voice control – Mobile app interfaces and feedback system.                                                               |                                                              |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                          | <b>WIRELESS HEALTH SYSTEMS</b>                               | <b>9 Periods</b> |
| Wireless technologies: Bluetooth, Wi-Fi, NFC – Overview of Body Area Networks (BAN) – Integration with smartphones and cloud platforms – Wearable system components: Processing units, batteries, displays – Data synchronization and storage – Privacy and security in wearable systems – Popular wearable platforms                                                                      |                                                              |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>HEALTHCARE, FITNESS AND ASSISTIVE APPLICATIONS</b>        | <b>9 Periods</b> |
| Wearable devices in healthcare – ECG, EEG, EMG monitoring – Chronic disease and elderly care – Smart patches and glucose monitoring – Fitness tracking: step count, heart rate, calorie burn – Gait and posture analysis – Physiotherapy and rehabilitation – Assistive wearables for visually and hearing-impaired – Industrial wearables: fatigue sensors, gas detectors, smart helmets. |                                                              |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                            | <b>DEFENSE, ENVIRONMENT AND SMART LIFESTYLE APPLICATIONS</b> | <b>9 Periods</b> |
| Wearables in military and defense – Smart uniforms – Soldier health monitoring – Wearable GPS and tracking – Body-worn cameras – Exosuits and wearable robotics – Environmental monitoring: UV, gas, and pollution – Smart textiles and LED garments – Haptic wearables for VR and gaming – Navigation aids and safety devices for visually impaired, children, and elderly.               |                                                              |                  |

**Total: 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                         |                                                                                                                                               |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b> | 1. Ramfis Nieto, "Designing Wearable Systems: Concepts and Implementation", McGraw-Hill, 2019.                                                |
|                         | 2. John A. Rogers and Roozbeh Ghaffari, "Bio-integrated Electronics: Materials, Systems, and Applications", Cambridge University Press, 2019. |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                       | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the fundamentals and evolution of wearable technology.     | Understand (K2)      |
| CO2                                                       | Explain the types of data and sensors used in wearable systems.       | Understand (K2)      |
| CO3                                                       | Explain the system components and connectivity of wearable devices.   | Understand (K2)      |
| CO4                                                       | Recognize smart textile concepts and user-centered wearable designs.  | Understand (K2)      |
| CO5                                                       | Analyze real-world applications and future developments in wearables. | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO2         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO3         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO4         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO5         | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23OEC010 - Wireless Sensor Networks**

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - ECE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                                            |
|---|--------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce wireless sensor networks, their architectures, node components, topologies, and short-range wireless standards.               |
| 2 | To study MAC and routing protocols tailored for wireless sensor networks with an emphasis on energy efficiency and performance trade-offs. |
| 3 | To understand the 6LoWPAN architecture and integration of IPv6 in low power and lossy networks including routing and mobility support.     |
| 4 | To explore application design issues, QoS requirements, energy management, and middleware protocols in WSNs.                               |
| 5 | To learn simulation tools and programming frameworks such as TinyOS, NesC, Contiki OS, and their use in WSN development and testing.       |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                 |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                  | <b>INTRODUCTION TO WIRELESS SENSOR NETWORKS</b> | <b>9 Periods</b> |
| Introduction to Wireless Sensor Networks – Motivation, Applications, and Challenges, Comparison with Ad Hoc Networks, Node Architecture – Sensor Node Components, Network Architecture – Types of Topologies, Design Principles, Service Interfaces, and Gateway Concepts, Short Range Wireless Communication Standards: IEEE 802.15.4, Zigbee, Bluetooth, Physical Layer and Transceiver Design Considerations. |                                                 |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                 | <b>MAC AND ROUTING PROTOCOLS</b>                | <b>9 Periods</b> |
| MAC Protocols – Fundamentals, Low Duty Cycle Protocols, Wakeup Concepts Contention and Schedule-Based Protocols – SMAC, BMAC, TRAMA Routing Protocols – Design Requirements, Classification SPIN, Directed Diffusion, LEACH, PEGASIS Routing Metrics and Performance Trade-offs.                                                                                                                                 |                                                 |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                | <b>6LoWPAN AND IPV6 INTEGRATION</b>             | <b>9 Periods</b> |
| 6LoWPAN Architecture – Protocol Stack and Adaptation Layer Link Layer Addressing and Routing (Mesh-Under, Route-Over) Header Compression – Stateless & Context-Based Fragmentation and Reassembly Mobility Support: Mobile IPv6, Proxy Mobile IPv6, Proxy Home Agent Routing for Low Power and Lossy Networks – ROLL, Border Routing, MANET Integration                                                          |                                                 |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                 | <b>APPLICATION DESIGN ISSUES</b>                | <b>9 Periods</b> |
| Application Design Issues – End-to-End, Real-Time Streaming, Publish/Subscribe Web Services and Middleware Protocol Paradigms Common Protocols – MQTT-S, ZigBee CAP, SNMP.                                                                                                                                                                                                                                       |                                                 |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                  | <b>QoS/ENERGY MANAGEMENT</b>                    | <b>9 Periods</b> |
| Real-time Transport QoS Requirements – Delay, Reliability, Throughput Energy Management – Power-aware MAC and Routing, Battery and Transmission Management Trade-offs Between QoS and Energy Efficiency.                                                                                                                                                                                                         |                                                 |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods



|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b> | 1. Holger Karl, Andreas willig, "Protocol and Architecture for Wireless Sensor Networks", John Wiley Publication, 2006.<br>2. Anna Forster, "Introduction to Wireless Sensor Networks", Wiley, 2017.<br>3. Zach Shelby Sensinode and Carsten Bormann, "6LoWPAN: The Wireless Embedded Internet" John Wiley and Sons, Ltd, Publication, 2009.<br>4. Philip Levis, "TinyOS Programming", 2006 –www.tinyos.net.<br>5. The Contiki Operating System.<br><a href="http://www.sics.se/contiki">http://www.sics.se/contiki</a> . |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**IV – Course Outcomes**

| On completion of the course, the students will be able to |                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Design solutions for WSNs applications.                      | Apply (K3)           |
| <b>CO2</b>                                                | Develop efficient MAC and Routing Protocols.                 | Analyze (K4)         |
| <b>CO3</b>                                                | Design solutions for 6LOWPAN applications.                   | Apply (K3)           |
| <b>CO4</b>                                                | Develop efficient layered protocols in 6LOWPAN.              | Analyze (K4)         |
| <b>CO5</b>                                                | Use Tiny OS and Contiki OS in WSNs and 6LOWPAN applications. | Apply (K3)           |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO5</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairman, Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23OEE01 - AI with Mat lab**

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - EEE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                    |
|---|--------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamentals of Artificial Intelligence and its real-world applications.                          |
| 2 | To familiarize students with the MATLAB environment for AI development.                                            |
| 3 | To develop the ability to implement AI algorithms such as search methods, knowledge representation, and reasoning. |
| 4 | To apply machine learning techniques using MATLAB toolboxes.                                                       |
| 5 | To enable students to design and simulate AI-based systems using MATLAB.                                           |

**III - Course Content**

|                                                                                                                                                                                                                                                                                        |                                                |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                        | <b>INTRODUCTION TO AI AND MATLAB</b>           | <b>9 Periods</b> |
| Basics of Artificial Intelligence – History, Applications, and Challenges- Overview of MATLAB – Environment, Scripts, Functions - Data handling and visualization in MATLAB - Introduction to MATLAB toolboxes for AI - Simple AI programs using MATLAB.                               |                                                |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                       | <b>PROBLEM SOLVING AND SEARCH TECHNIQUES</b>   | <b>9 Periods</b> |
| Uninformed Search: BFS, DFS, Depth-Limited Search - Informed Search: A*, Best-First Search, Heuristic Functions - Constraint Satisfaction Problems - Implementation of search strategies in MATLAB - Case studies using AI search in MATLAB.                                           |                                                |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                      | <b>KNOWLEDGE REPRESENTATION AND REASONING</b>  | <b>9 Periods</b> |
| Propositional and Predicate Logic - Rule-Based Systems and Inference Mechanisms - Forward and Backward Chaining - Uncertainty and Probabilistic Reasoning - MATLAB implementation of logical reasoning systems.                                                                        |                                                |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                       | <b>MACHINE LEARNING WITH MATLAB</b>            | <b>9 Periods</b> |
| Supervised Learning: Regression, Classification - Unsupervised Learning: Clustering Techniques - Dimensionality Reduction and Data Preprocessing - Introduction to MATLAB Machine Learning Toolbox - Case studies: Fault detection, Image classification.                              |                                                |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                        | <b>NEURAL NETWORKS AND FUZZY LOGIC SYSTEMS</b> | <b>9 Periods</b> |
| Basics of Artificial Neural Networks (ANNs) - Designing and Training Neural Networks in MATLAB - Introduction to Fuzzy Logic and Fuzzy Inference Systems - Building Fuzzy systems using MATLAB Fuzzy Logic Toolbox - Applications in control systems, prediction, and decision-making. |                                                |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**Total: 45 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach, 4th US edition", Pearson Education, 2022.<br>2. Phil Kim, MATLAB Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence: A practical guide for AI and deep learning with MATLAB, Apress, 2017.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>MOOC/Web Platforms:</b> | 1. MATLAB Official Documentation (AI & ML Toolboxes)<br><a href="https://www.mathworks.com/products/artificial-intelligence.html">https://www.mathworks.com/products/artificial-intelligence.html</a><br>2. MATLAB Tutorials and Examples (MathWorks)<br><a href="https://www.mathworks.com/learn/tutorials/matlab-onramp.html">https://www.mathworks.com/learn/tutorials/matlab-onramp.html</a><br>3. AI Projects in MATLAB – File Exchange<br><a href="https://www.mathworks.com/matlabcentral/fileexchange/">https://www.mathworks.com/matlabcentral/fileexchange/</a><br>4. Coursera – Introduction to AI with MATLAB<br><a href="https://www.coursera.org/learn/ai-for-everyone">https://www.coursera.org/learn/ai-for-everyone</a><br>5. MATLAB and Simulink Training – MathWorks<br><a href="https://www.mathworks.com/services/training.html">https://www.mathworks.com/services/training.html</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand and explain key concepts of Artificial Intelligence and their applications.        | Understand (K2)      |
| CO2                                                       | Implement AI techniques including search algorithms and knowledge-based systems using MATLAB. | Apply (K3)           |
| CO3                                                       | Apply machine learning models in MATLAB for classification, clustering, and regression tasks. | Apply (K3)           |
| CO4                                                       | Develop intelligent systems using neural networks and fuzzy logic in MATLAB.                  | Apply (K3)           |
| CO5                                                       | Simulate and analyze AI-driven solutions for practical engineering problems.                  | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 2   | 1   | 1   | -   | -   | -   | -   | 1    | -    | -    | 1    | 1    | -    |
| CO2         | 3   | 3   | 3   | 2   | 1   | -   | -   | -   | -   | 1    | -    | -    | 1    | 1    | -    |
| CO3         | 3   | 3   | 3   | 2   | 1   | -   | -   | -   | -   | 1    | -    | -    | 1    | 1    | -    |
| CO4         | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | -   | 1    | -    | -    | 1    | 1    | -    |
| CO5         | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | -   | 1    | -    | -    | 1    | 1    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OEE02 - APPLIED SOFT COMPUTING

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - EEE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                                      |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the basic principles and scope of soft computing techniques such as fuzzy logic, neural networks, and genetic algorithms.               |
| 2 | To impart knowledge on fuzzy set theory and fuzzy logic controllers, including their application in electrical engineering.                          |
| 3 | To explore the structure, learning methods, and practical applications of neural networks.                                                           |
| 4 | To understand the functioning of genetic algorithms and how they are applied to electrical engineering problems.                                     |
| 5 | To train students in using MATLAB toolboxes for implementing fuzzy logic, neural networks, and genetic algorithms in real-world electrical problems. |

## III - Course Content

|                                                                                                                                                                                                                                                                                  |                           |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                  | <b>INTRODUCTION</b>       | <b>9 Periods</b> |
| Introduction to soft computing - Fuzzy logic, Neural Network and Genetic algorithm.                                                                                                                                                                                              |                           |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                 | <b>FUZZY LOGIC</b>        | <b>9 Periods</b> |
| Fuzzy sets, logic operations, and relations; Fuzzy decision-making; fuzzy inference systems; design steps in fuzzy logic controller; application of fuzzy logic controller in Electrical engineering.                                                                            |                           |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                | <b>NEURAL NETWORKS</b>    | <b>9 Periods</b> |
| Basic concepts and major classes of neural networks, supervised and unsupervised learning, Single-layer perceptron, multi-layer perceptron, Back Propagation Neural network, RBF networks. Application of neural network modelling / control problems in Electrical engineering. |                           |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                 | <b>GENETIC ALGORITHMS</b> | <b>9 Periods</b> |
| Introduction - genetic algorithm steps-Selection, Crossover and Mutation; Application of GA to Electrical engineering problems.                                                                                                                                                  |                           |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                  | <b>APPLICATION</b>        | <b>9 Periods</b> |
| Use of MATLAB Fuzzy logic, Neural network and GA toolboxes to solve electrical engineering problems.                                                                                                                                                                             |                           |                  |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley India Pvt. Ltd., 2nd Edition, 2011.<br>2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley, 4th Edition, 2020.                                                                                                                                                                                                                                                                                         |
| <b>Reference Books:</b>    | 1. Simon Haykin, Neural Networks and Learning Machines, Pearson Education, 3rd Edition, 2008.<br>2. David E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Pearson Education, 1989.<br>3. Satish Kumar, Neural Networks: A Classroom Approach, McGraw-Hill Education, 2nd Edition, 2017.<br>4. J.S.R. Jang, C.T. Sun, and E. Mizutani, Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, Pearson Education, 2004. |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc22_cs54/preview">https://onlinecourses.nptel.ac.in/noc22_cs54/preview</a>                                                                                                                                                                                                                                                                                                                                                                      |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain the fundamental concepts and components of soft computing.                                               | Understand (K2)      |
| CO2                                                       | Design and apply fuzzy logic systems in electrical engineering contexts.                                         | Apply (K3)           |
| CO3                                                       | Construct and use neural network models for analysis and control tasks in electrical systems.                    | Analyze (K4)         |
| CO4                                                       | Implement genetic algorithm procedures for solving electrical engineering optimization problems.                 | Apply (K3)           |
| CO5                                                       | Apply MATLAB tools to model and solve real-time electrical engineering problems using soft computing techniques. | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 2   | 1   | 1   | -   | -   | -   | -   | 1    | -    | -    | -    | 1    | -    |
| CO2         | 3   | 3   | 3   | 2   | 1   | -   | -   | -   | -   | 1    | -    | -    | -    | 1    | -    |
| CO3         | 3   | 3   | 3   | 2   | 1   | -   | -   | -   | -   | 1    | -    | -    | -    | 1    | -    |
| CO4         | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | -   | 1    | -    | -    | -    | 1    | -    |
| CO5         | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | -   | 1    | -    | -    | -    | 1    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401

**I - Course Name: 23OEE03 - ELECTRIC VEHICLE TECHNOLOGY**

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - EEE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                                                                                      |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand the principles of electromechanical energy conversion and the characteristics of various electrical machines used in electric and hybrid electric vehicles.            |
| 2 | To analyze the operation and characteristics of different types of power electronic converters and their applications in motor drive systems.                                        |
| 3 | To study the control strategies for DC and AC motor drives including advanced techniques used in electric vehicle propulsion systems.                                                |
| 4 | To explore the architecture, powertrain components, and energy storage systems used in hybrid and electric vehicles.                                                                 |
| 5 | To apply the fundamentals of vehicle mechanics for analyzing drive cycles, powertrain sizing, and implementing control and energy management strategies in hybrid electric vehicles. |

**III - Course Content**

|                                                                                                                                                                                                                                                     |                                                                        |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                     | <b>ROTATING POWER CONVERTERS</b>                                       | <b>9 Periods</b> |
| Magnetic Circuits and Electromechanical Energy Conversion- DC Machines- AC Machines- Special Electrical Machines (BLDC, PMSM & SRM)- Power Electronic Converters for Motor Drives- Applications in Electric Vehicles and Renewable Energy Systems   |                                                                        |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                    | <b>STATIC POWER CONVERTERS</b>                                         | <b>9 Periods</b> |
| Working and Characteristics of Power Diodes, MOSFET and IGBT. Working of uncontrolled rectifiers, controlled rectifiers (Single phase and three phase), DC choppers, single and three phase inverters, Multilevel inverters, and Matrix Converters. |                                                                        |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                   | <b>CONTROL OF DC AND AC MOTOR DRIVES</b>                               | <b>9 Periods</b> |
| Fundamentals of Electric Drive Dynamics-DC Motor Drive Control (Chopper, four quadrant) - Induction Motor Drives (v/f, Inverter - fed) - Vector Control of AC Motors (IM, PMSM)-BLDC -SRM - Advanced Control and Implementation Techniques.         |                                                                        |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                    | <b>HYBRID ELECTRIC VEHICLE ARCHITECTURE AND POWER TRAIN COMPONENTS</b> | <b>9 Periods</b> |
| Evolution and Classification of Electrified Vehicles – Comparison – Powertrain Components and Energy Storage – Mechanical Subsystems of Powertrain - Advanced Technologies and Trends.                                                              |                                                                        |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                     | <b>MECHANICS OF HYBRID ELECTRIC VEHICLES AND CONTROL OF VEHICLES</b>   | <b>9 Periods</b> |
| Fundamentals of Vehicle Mechanics - Drive Cycle Analysis and Powertrain Sizing - Hybrid Electric Vehicle Architectures – supervisory Control and Energy Management – Advanced Control Strategies – Intelligent Vehicle Control and Integration      |                                                                        |                  |

**Total: 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | 1. Stephen D. Umans, "Fitzgerald & Kingsley's Electric Machinery", Tata McGraw Hill, 7th Edition, 2020.<br>2. Bogdan M. Wilamowski, J. David Irwin, The Industrial Electronics Handbook, Second Edition, Power Electronics and Motor Drives, CRC Press, 2011                                                                                                                                                                                                                                                                                                                         |
| <b>Reference Books:</b> | 1. Paul C. Krause, Oleg Wasynczuk, Scott D. Sudhoff, Steven D. Pekarek "Analysis of Electric Machinery and Drive Systems", 3rd Edition, Wiley-IEEE Press, 2013.<br>2. Rashid M.H., "Power Electronics Circuits, Devices and Applications ", Pearson, fourth Edition, 10th Impression 2021.<br>3. Iqbal Husain, 'Electric and Hybrid Electric Vehicles', CRC Press, 2021.<br>4. Wei Liu, 'Hybrid Electric Vehicle System Modeling and Control', Second Edition, WILEY, 2017<br>5. James Larminie and John Lowry, 'Electric Vehicle Technology Explained', Second Edition, Wiley, 2012 |

#### IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the operating principles and characteristics special machines used in electric mobility        | Understand (K2)      |
| CO2                                                       | Analyze the structure and functionality of power semiconductor devices in electric vehicle applications   | Analyze (K4)         |
| CO3                                                       | Analyze the control strategies for DC and AC electric drives.                                             | Analyze (K4)         |
| CO4                                                       | Clarify the architecture of electric and hybrid electric vehicles and inverters.                          | Analyze (K4)         |
| CO5                                                       | Apply the fundamentals of vehicle mechanics to evaluate energy requirements and hybrid electric vehicles. | Apply (K3)           |

#### V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | -   | -   | -   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO2         | 3   | 3   | -   | -   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO3         | 3   | 3   | -   | 2   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO4         | 3   | 3   | 2   | 2   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO5         | 3   | 2   | -   | -   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OEE04 - ELECTRIC SAFETY

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - EEE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                        |
|---|----------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamental concepts of electrical safety, including the nature of electrical shocks and preventive measures.         |
| 2 | To familiarize students with national and international electrical safety standards, codes, and statutory requirements.                |
| 3 | To provide knowledge on electrical protection methods, maintenance procedures, and first aid techniques for electrical hazards.        |
| 4 | To equip students with the skills to conduct energy audits for various electrical systems and recommend energy-saving techniques.      |
| 5 | To develop an understanding of safety management practices, policies, and motivation strategies to foster a safety-oriented workplace. |

## III - Course Content

|                                                                                                                                                                                                                                                                                                    |                                                                       |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                    | <b>INTRODUCTION TO ELECTRICAL SAFETY, SHOCKS AND THEIR PREVENTION</b> | <b>9 Periods</b> |
| Review of Electrical concept, Electrostatic – Electro magnetism – Electrical Hazards – Energy leakage – Clearance and insulation – Current surges – Electrical causes of fire and explosion – Human interface with electricity – Human resistance to electricity.                                  |                                                                       |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                   | <b>STANDARDS AND REQUIREMENTS</b>                                     | <b>9 Periods</b> |
| National electrical Safety code - Standards and statutory requirements – Indian electricity acts and rules – statutory requirements from Electrical inspectorate. Hazardous area classification and Classification of electrical equipment for hazardous areas (IS, NFPA, API and OSHA standards). |                                                                       |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                  | <b>ELECTRICAL PROTECTION AND MAINTENANCE</b>                          | <b>9 Periods</b> |
| Selection of Environment, Protection and Interlock – Discharge rods and earthing device – Safety in the use of portable tools - Preventive maintenance. First aid-Cardio Pulmonary Resuscitation (CPR).                                                                                            |                                                                       |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                   | <b>ENERGY AUDIT OF ELECTRICAL SYSTEMS</b>                             | <b>9 Periods</b> |
| Instruments for energy audit - energy audit of heating, ventilation and air conditioning systems - energy audit of compressed air systems - energy audit of buildings - energy audit of electric drive utilities-energy efficient electrical systems- types and tips for improvement in industry.  |                                                                       |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                    | <b>SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS</b>                        | <b>9 Periods</b> |
| Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees towards safety.                                                                                                                                    |                                                                       |                  |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OEE05 - E-waste Management

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - EEE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                                                      |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Gaining knowledge about the current state of e-waste generation, collection, and disposal, both globally and in specific regions.                                    |
| 2 | Learning about the potential risks associated with e-waste, including the release of hazardous materials and their impact on ecosystems and human health.            |
| 3 | Studying national and international laws and regulations governing e-waste management, such as the E-Waste (Management) Rules.                                       |
| 4 | Learning about the emerging technologies and green chemistry                                                                                                         |
| 5 | Exploring various methods for reducing, reusing, recycling, and responsibly disposing of e-waste, including techniques for material recovery and waste minimization. |

## III - Course Content

|                                                                                                                                                                        |                                                           |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                        | <b>GENERAL CONCEPTS TO E WASTE AND E-WASTE MANAGEMENT</b> | <b>9 Periods</b> |
| Introduction and general concepts to e-waste and e-waste management; Principle and standards for the disposal; Life cycle and Performance assessment and understanding |                                                           |                  |
| <b>Unit – II</b>                                                                                                                                                       | <b>HEALTH EFFECTS OF E-WASTE POLLUTION</b>                | <b>9 Periods</b> |
| Health Effects of E-waste Pollution; Global Trends of E-waste Pollution and Its Impact on Environment                                                                  |                                                           |                  |
| <b>Unit – III</b>                                                                                                                                                      | <b>MATERIAL RECYCLING AND PROCESSING TECHNIQUES</b>       | <b>9 Periods</b> |
| E-waste: Global Scenario, Constituents, and Biological Strategies for Remediation Materials Recycling Considerations Processing Techniques.                            |                                                           |                  |
| <b>Unit – IV</b>                                                                                                                                                       | <b>GREEN CHEMISTRY</b>                                    | <b>9 Periods</b> |
| Emerging Technologies Bioremediation Approaches e-factor concept in green chemistry Case studies: implementation of e-waste recycling                                  |                                                           |                  |
| <b>Unit – V</b>                                                                                                                                                        | <b>RECYCLING PROCESS</b>                                  | <b>9 Periods</b> |
| Recycling Processes and Plastic in e-waste is an emerging problem for India: Implications for Future Prospect                                                          |                                                           |                  |

Total: 45 Periods

  
 Chairperson - Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Hugo Marcelo Veit and Andréa Moura Bernardes, "Electronic Waste: Recycling Techniques" Springer 2015.<br>2. Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi                                                                                                                                                                                                                                                                                        |
| <b>Reference Books:</b>    | 1. Hester R.E., and Harrison R.M, Electronic Waste Management. Science, 2009<br>2. Muammer Kaya, "Electronic Waste and Printed Circuit Board Recycling Technologies", Springer 2019.<br>3. Muhammad Zaffar Hashmi and Ajit Varma, "Electronic Waste Pollution: Environmental Occurrence and Treatment Technologies", Springer 2019.<br>4. Lifeng Zhang and Gregory K. Krumbick, "Recycling of Electronic Waste II", Wiley 2011.<br>5. Fowler B, Electronic Waste – 1 st Edition (Toxicology and Public Health Issues), 2017 Elsevier |
| <b>MOOC/Web Platforms:</b> | <a href="https://news.mit.edu/2013/ewaste-mit">https://news.mit.edu/2013/ewaste-mit</a>                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                      | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the environmental impacts of e-waste.                                                                     | Understand (K2)      |
| <b>CO2</b>                                                | Apply concepts of e-waste management hierarchy.                                                                      | Apply (K3)           |
| <b>CO3</b>                                                | Distinguish the role of various national and internal act and laws applicable for e-waste management and handling.   | Analyze (K4)         |
| <b>CO4</b>                                                | Analyze the e – waste management measures proposed under national and global legislations.                           | Analyze (K4)         |
| <b>CO5</b>                                                | To assess the overall sustainability of e-waste, considering the three pillars: environmental, economic, and energy. | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 2   | -   | -   | -   | -   | 3   | 3   | -   | -   | -    | 1    | -    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | -   | -   | -   | 3   | 3   | -   | -   | -    | 1    | -    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | -   | 2   | -   | 3   | 3   | -   | -   | -    | 1    | -    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 2   | 2   | -   | 3   | 3   | -   | -   | -    | 1    | -    | -    | -    | -    |
| <b>CO5</b>  | 3   | 2   | -   | -   | -   | 3   | 3   | -   | -   | -    | 1    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OEE06 - INDUSTRIAL AUTOMATION

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - EEE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                                                                            |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamentals of industrial automation systems, including their architecture and essential communication protocols such as Modbus and Profibus.                            |
| 2 | To familiarize students with key automation components like sensors, actuators, process control valves, and power electronic devices used in industrial systems.                           |
| 3 | To impart knowledge on computer-aided measurement and control systems, including data acquisition, process interfaces, and industrial communication systems.                               |
| 4 | To develop the ability to program, configure, and implement Programmable Logic Controllers (PLCs) in industrial process control and automation applications.                               |
| 5 | To understand the structure and operation of Distributed Control Systems (DCS), including software configurations, communication protocols, and integration with other automation systems. |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                       |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>INTRODUCTION</b>                                   | <b>9 Periods</b> |
| Basics of industrial automation, Requirement of automation systems, Architecture of Industrial Automation system, Introduction of PLC and supervisory control and data acquisition (SCADA)- Flexible manufacturing system (FMS) - Industrial bus systems: Modbus & Profibus                                                                                                                                                                                                                                                                                          |                                                       |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>AUTOMATION COMPONENTS</b>                          | <b>9 Periods</b> |
| Measurement Systems Characteristics - Sensors for temperature, pressure, force, displacement, speed, flow, level, humidity and pH measurement. Actuators, process control valves, power electronics devices DIAC, TRIAC, power MOSFET and IGBT. Introduction of DC and AC servo drives for motion control.                                                                                                                                                                                                                                                           |                                                       |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>COMPUTER AIDED MEASUREMENT AND CONTROL SYSTEMS</b> | <b>9 Periods</b> |
| Role of computers in measurement and control, Elements of computer aided measurement and control, man- machine interface, computer aided process control hardware, process related interfaces, Communication and networking, Industrial communication systems, Data transfer techniques, Computer aided process control software, Computer based data acquisition system, Advanced automation functions, Levels of automations, Automated flow lines and transfer mechanisms - Analysis of transfer lines without storage, Automated flow lines with storage buffers |                                                       |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>PROGRAMMABLE LOGIC CONTROLLERS</b>                 | <b>9 Periods</b> |
| Programmable controllers, Programmable logic controllers, Analog digital input and output modules, PLC programming, Ladder diagram, Sequential flow chart, PLC Communication and networking, PLC selection, PLC Installation, Advantage of using PLC for Industrial automation, Application of PLC to process control industries                                                                                                                                                                                                                                     |                                                       |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>DISTRIBUTED CONTROL SYSTEM</b>                     | <b>9 Periods</b> |
| introductions to computer based industrial automation – Direct Digital Control (DDC) – DCS software configuration, DCS communication, DCS Supervisory Computer Tasks, DCS integration with PLC and Computers, Features of DCS, Advantages of DCS – Transport Automation                                                                                                                                                                                                                                                                                              |                                                       |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods

|                         |                                                                                                                                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | 1. S.K.Singh, "Industrial Instrumentation", Tata Mcgraw Hill, 2nd edition companies, 2003.<br>2. C D Johnson, "Process Control Instrumentation Technology", Prentice Hall India, 8th Edition, 2006. |
| <b>Reference Books:</b> | 1. E.A.Parr, Newnes, New Delhi, "Industrial Control Handbook", 3 <sup>rd</sup> Edition, 2000.                                                                                                       |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                 | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the signal conditioning circuits for a variety of industrial and automation applications                             | Understand (K2)      |
| CO2                                                       | Establish an in-depth understanding of data acquisition systems, interfacing techniques, and Distributed Control Systems (DCS). | Apply (K3)           |
| CO3                                                       | Clarify the fundamentals and significance of communication buses used in applied automation engineering                         | Analyze (K4)         |
| CO4                                                       | Understand the ladder logic and function block programs for PLCs using timers, counters, arithmetic, and logic instructions.    | Analyze (K4)         |
| CO5                                                       | Analyze the advanced PLC logic solutions for real- world industrial automation problems                                         | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | -   | -   | -   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO2         | 3   | 3   | -   | -   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO3         | 3   | 3   | -   | 2   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO4         | 3   | 3   | 2   | 2   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO5         | 3   | 2   | -   | -   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23OEE07 - POWER PLANT INSTRUMENTATION**

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - EEE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                                                                                             |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Understand the methods and instruments used for measuring metal temperature in boilers.                                                                                                     |
| 2 | Understand different types of draught plants (natural, forced, induced, balanced) and their power requirements. Learn about fan drives, airflow control, and combustion control techniques. |
| 3 | Understand automation concepts specific to thermal power plants. Learn about boiler automation systems including diagnostic functions and protection mechanisms.                            |
| 4 | Understand the piping and instrumentation diagrams of different types of nuclear power plants.                                                                                              |
| 5 | Gain an introduction to Industrial Internet of Things (IIoT) applications in power plants. Understand smart grid technologies and their impact on power plant instrumentation.              |

**III - Course Content**

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                | MEASUREMENT IN BOILER AND TURBINE   | 9 Periods |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------|
| Metal temperature measurement in boilers, impulse-piping system for pressure measuring devices, flame monitoring. Introduction to turbine supervising system, pedestal vibration, shaft vibration, eccentricity measurement. Installation of non-contracting transducers for speed measurement, rotor and casing movement and expansion measurement.                                                                                    |                                     |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                               | CONTROLS IN BOILER                  | 9 Periods |
| Problems associated with control of multiple pulverizers. Draught plant: Introduction, natural draught, forced draught, induced draught, balanced draught, power requirements for draught systems. Fan drives and control, control of airflow. Combustion control: Fuel/Air ratio, oxygen, CO and CO <sub>2</sub> trimming, combustion efficiency, excess air, parallel and cross limited combustion control, control of large systems. |                                     |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                              | AUTOMATION                          | 9 Periods |
| Automation: Thermal power plant, Boiler Automation – Diagnostic Functions and Protection – Digital Electro – Hydraulic Governor, Man-Machine Interface – Graphic Display of Automated Power plant.                                                                                                                                                                                                                                      |                                     |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                               | NUCLEAR POWER PLANT INSTRUMENTATION | 9 Periods |
| Piping and instrumentation diagram of different types of nuclear power plant, nuclear reactor control loops, reactor dynamics, excess reactivity, pulse channel and logarithmic instrumentation, control and safety instrumentation, reliability aspects.                                                                                                                                                                               |                                     |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                | EMERGING TRENDS AND APPLICATIONS    | 9 Periods |
| Introduction to the Industrial Internet of Things (IIoT) in power plants. Smart grid technologies and their impact on instrumentation. Simulation and modeling of power plant system.                                                                                                                                                                                                                                                   |                                     |           |

**Total: 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Philip Kiameh, Power Plant Instrumentation and Control Handbook<br>2. B. D. Taylor, 'Instrumentation for Engineers and Technicians'<br>3. Modern Power Station Practice – British Electricity International |
| <b>Reference Books:</b>    | 1. Bela G. Liptak, Instrumentation in Industry<br>2. P.K. Nag, "Power Plant Engineering"<br>3. K.K. Ramalingam, "Power Plant Instrumentation"                                                                  |
| <b>MOOC/Web Platforms:</b> | 1. NPTEL (National Programme on Technology Enhanced Learning)<br>2. Coursera (e.g., Energy Production, Distribution & Safety)<br>3. edX (e.g., Smart Grids, Control Systems)                                   |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain basic thermal power plant processes and layout                         | Understand (K2)      |
| <b>CO2</b>                                                | Identify and describe the operation of instrumentation devices in power plants | Apply (K3)           |
| <b>CO3</b>                                                | Analyze control strategies used in boiler and turbine operations               | Analyze (K4)         |
| <b>CO4</b>                                                | Select appropriate control systems for different power plant functions         | Analyze (K4)         |
| <b>CO5</b>                                                | Discuss advancements in combined cycle power generation                        | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 2   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO5</b>  | 2   | 2   | -   | -   | 3   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OEE08 - PRINCIPLES OF ROBOTICS

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - EEE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                       |
|---|-----------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamental components and mechanical structure of robotic systems.                                  |
| 2 | To impart knowledge on spatial descriptions, coordinate transformations, and kinematic modeling using D-H parameters. |
| 3 | To analyze and design actuator and sensor systems for robotic control.                                                |
| 4 | To develop trajectory planning techniques and implement control strategies.                                           |
| 5 | To explore the integration of Artificial Intelligence and expert systems in robotics with real-world case studies.    |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | FUNDAMENTALS OF ROBOT                               | 9 Periods |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------|
| Introduction: Fundamentals and robot - components, joints, degrees of freedom, coordinates. The mechanics & control of mechanical manipulators. Spatial Descriptions and Transformations: Descriptions – Positions, Orientations, and Frames, Mappings, Operators – Translations, Rotations, and Transformations, Transformation arithmetic and transform equations, transformation of free vectors, Representation & Orientation                                                                              |                                                     |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | REPRESENTATION AND KINEMATICS OF ROBOTIC STRUCTURES | 9 Periods |
| Representation and Transformation of joints, links Mechanical Structure notations, Coordinate frames, Description of objects in space, Transformation and fundamental rotation matrices, Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Kinematics: Forward kinematics of multi DOF manipulator - Inverse kinematics of 2DOF manipulator. Homogeneous transformation matrices, translation and rotation matrices   |                                                     |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ELEMENTS OF ROBOTS                                  | 9 Periods |
| Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common sensors – encoders, tachometers, strain gauge based force-torque sensors, proximity and distance measuring sensors, and vision. |                                                     |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | TRAJECTORY PLANNING AND ROBOT PROGRAMMING           | 9 Periods |
| Trajectory planning, joint space techniques, cartesian space formulation. Control of manipulator, PID control scheme, computed torque control, force control of robotic manipulators. Robot Programming Robot Programming: Manual programming – Teach Pendant, Offline Programming - Welding, Online programming – Deburring, Palletizing and Inspection.                                                                                                                                                      |                                                     |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | AI AND ROBOTICS                                     | 9 Periods |
| Artificial Intelligence in Robotics Expert systems, Artificial Intelligence- Knowledge Representation, AI in Robotics, Case studies                                                                                                                                                                                                                                                                                                                                                                            |                                                     |           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. John J. Craig, <i>Introduction to Robotics: Mechanics and Control</i> , 4th Edition, Pearson Education, Boston, Massachusetts, 2022. ISBN: 978-0-13-784874-4.<br>2. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, <i>Robot Modeling and Control</i> , 2nd Edition, Wiley, Hoboken, New Jersey, 2020. ISBN: 978-1-119-52404-5.                                                                                                                                  |
| <b>Reference Books:</b>    | 1. Stuart Russell and Peter Norvig, <i>Artificial Intelligence: A Modern Approach</i> , 4th Edition, Pearson, Hoboken, New Jersey, 2020. ISBN: 978-0-13-461099-3.<br>2. Robert J. Schilling, <i>Fundamentals of Robotics: Analysis and Control</i> , 1st Edition, Pearson Education, Upper Saddle River, New Jersey, 1990.<br>3. Stuart Russell and Peter Norvig, <i>Artificial Intelligence: A Modern Approach</i> , 4th Edition, Pearson, Hoboken, New Jersey, 2020. |
| <b>MOOC/Web Platforms:</b> | <a href="https://archive.nptel.ac.in/courses/112/104/112104298/">https://archive.nptel.ac.in/courses/112/104/112104298/</a><br>Introduction to Robotics IIT Kanpur Prof. T.Asokan                                                                                                                                                                                                                                                                                      |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                             | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Identify and describe the fundamental components, joint types, and degrees of freedom in robotic systems.                   | Understand (K2)      |
| CO2                                                       | Apply spatial transformation techniques to represent positions and orientations of robotic links and end-effectors.         | Apply (K3)           |
| CO3                                                       | Model robotic joints and links using Denavit-Hartenberg (D-H) parameters and solve forward and inverse kinematics problems. | Apply (K3)           |
| CO4                                                       | Analyze and select appropriate actuators and sensors for robotic applications based on functionality and requirements.      | Analyze (K4)         |
| CO5                                                       | Design and implement trajectory planning and control schemes for robotic manipulators in both joint and Cartesian spaces.   | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO2         | 3   | 3   | 2   | 2   | -   | -   | -   | -   | 1   | -    | 1    | -    | 1    | -    | -    |
| CO3         | 3   | 3   | 3   | 2   | 1   | -   | -   | -   | 1   | -    | 1    | -    | 1    | -    | -    |
| CO4         | 3   | 2   | 3   | 2   | -   | -   | -   | -   | 1   | -    | 1    | -    | 1    | -    | -    |
| CO5         | 3   | 2   | 2   | 3   | 2   | -   | -   | -   | 2   | -    | 2    | -    | 1    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OEC09 - SENSORS AND TRANSDUCERS

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - EEE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                       |
|---|---------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To understand the concepts of measurement technology.                                                                                 |
| 2 | To learn the various sensors used to measure various physical parameters.                                                             |
| 3 | To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development. |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                         |                                                  |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                         | <b>INTRODUCTION TO MEASUREMENTS AND SENSORS</b>  | <b>9 Periods</b> |
| Basics of Measurements – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types- Performance measures of sensors.                                                                                       |                                                  |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                        | <b>VARIABLE RESISTANCE AND INDUTANCE SENSORS</b> | <b>9 Periods</b> |
| Motion Proximity Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, Linear Variable transducer (LVDT) – Rotary Variable transducer RVDT – Synchro – Microsyn, Accelerometer, – GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR)     |                                                  |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                       | <b>VARIABLE AND OTHER SPECIAL SENSORS</b>        | <b>9 Periods</b> |
| Types of Strain Guage, Load Cell, Magnetic Sensors –principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.                                                                                                                                        |                                                  |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                        | <b>AUTOMOTIVE ACTUATORS</b>                      | <b>9 Periods</b> |
| Photo resistive, Photo conductive cell, photo voltaic, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors. |                                                  |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                         | <b>AUTOMATIC TEMPERATURE CONTROL ACTUATORS</b>   | <b>9 Periods</b> |
| Sample and Hold circuits – Data Acquisition: Single channel and multi-channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring                                                                                                                          |                                                  |                  |

Total: 45 Periods

|                         |                                                                                                                                                                                                                                                                                                           |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | 1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009.<br>2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, Dhanpat Rai & Co, New Delhi, 2013.                                                |
| <b>Reference Books:</b> | 1. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2010.<br>2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 1999.<br>3. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015. |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Expertise in various calibration techniques and signal types for sensors.    | Understand (K2)      |
| CO2                                                       | Apply the various sensors in the Automotive and Mechatronics applications.   | Apply (K3)           |
| CO3                                                       | Study the basic principles of various smart sensors.                         | Understand (K2)      |
| CO4                                                       | Implement the DAQ systems with different sensors for real time applications. | Analyze (K4)         |
| CO5                                                       | Analyze applications of advanced sensor technologies in smart systems.       | Analyze (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | -   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO2         | 2   | 2   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO3         | 1   | -   | 2   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO4         | 2   | 2   | 3   | 2   | 1   | -   | -   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO5         | 2   | 2   | 2   | 3   | 2   | -   | -   | -   | -   | -    | -    | -    | 1    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                         |                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | 1. John Codick, "Electrical safety handbook", 4th Edition, McGraw Hill Professional, 2012, New Delhi.<br>2. C.S. Raju, "A Practical Book on domestic safety", Sri Sai Publisher, Chennai - 2003. 3. Power Engg. Hand book, TNEB Engineers officers, Chennai-2002.                                                                                                                      |
| <b>Reference Books:</b> | 1. Rao - R.C, Khanna, "Electrical safety, Fire safety engineering and safety management", 2nd Edition, Khanna Publisher, 2012, New Delhi.<br>2. Trivedi P.R., Jolka B.R., "Energy Management", Common Wealth Publishers, New Delhi, 1997.<br>3. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management, Fifth Edition, The Fairmont Press, Inc., 2006 |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                 | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Identify various electrical hazards and explain methods for preventing electrical shocks and fire incidents.                                    | Understand (K2)      |
| <b>CO2</b>                                                | Interpret and apply national and international electrical safety standards and statutory requirements in real-world scenarios.                  | Apply (K3)           |
| <b>CO3</b>                                                | Demonstrate appropriate electrical protection techniques and perform basic preventive maintenance and emergency first aid (CPR).                | Apply (K3)           |
| <b>CO4</b>                                                | Conduct energy audits in electrical systems and recommend measures for improving energy efficiency in industrial and building applications.     | Analyze (K4)         |
| <b>CO5</b>                                                | Implement principles of electrical safety management and develop safety policies, audit strategies, and motivation techniques in organizations. | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 2   | -   | -   | -   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| <b>CO2</b>  | 3   | 3   | -   | -   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| <b>CO3</b>  | 3   | 3   | -   | 2   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 2   | 2   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |
| <b>CO5</b>  | 3   | 2   | -   | -   | -   | 3   | 3   | -   | -   | -    | -    | -    | 1    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OEE10 - SOLAR AND WIND ENERGY RESOURCES

| Prerequisite | Program Name                    | Sem      | Category | L | T | P | C |
|--------------|---------------------------------|----------|----------|---|---|---|---|
| Nil          | All programmes except B.E - EEE | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                           |
|---|---------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the fundamentals of solar energy, its availability, and its role in the renewable energy landscape.          |
| 2 | To explain the working principles and performance characteristics of solar cells and photovoltaic technologies.           |
| 3 | To enable students to understand the design, components, and operation of photovoltaic (PV) systems.                      |
| 4 | To provide foundational knowledge on wind energy, including wind resource assessment and conversion principles.           |
| 5 | To familiarize students with different types of wind turbines and their performance characteristics in energy generation. |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                            |                                          |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                            | <b>INTRODUCTION TO SOLAR ENERGY</b>      | <b>9 Periods</b> |
| Basic characteristics of sunlight – solar spectrum – insolation specifics– irradiance and irradiation- pyranometer – Solar PV cell- Simplest equivalent circuit for a photovoltaic cell – Solar cells to modules, Solar cells to arrays I-V characteristics – P-V characteristics – fill factor.                                                           |                                          |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                           | <b>PERFORMANCE OF SOLAR CELLS</b>        | <b>9 Periods</b> |
| Parameters of solar cells, solar cell technologies – Factors affecting electricity generated by a solar cell, Solar PV module, Standard PV module parameters, IV and PV characteristics of SPV module, Solar PV modules arrays – connection of modules in series and parallel                                                                              |                                          |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                          | <b>PHOTOVOLTAIC SYSTEMS</b>              | <b>9 Periods</b> |
| Introduction to Simplified grid connected PV systems, Current voltage curves for loads – DC motor IV curves - Battery IV curves – maximum power point trackers – hourly IV curves, grid connected systems                                                                                                                                                  |                                          |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                           | <b>INTRODUCTION TO WIND ENERGY</b>       | <b>9 Periods</b> |
| Nature of the wind – Types of wind turbines, power in the wind – factors influencing wind – wind energy potential and installation in India- wind speed monitoring - wind resource assessment -wind power laws - velocity and power duration curves - Betz limit - site selection.                                                                         |                                          |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                            | <b>WIND ENERGY CONVERSION TECHNIQUES</b> | <b>9 Periods</b> |
| Wind energy conversion devices - classification, characteristics- Wind Turbine Generators Asynchronous (Induction) generator- Squirrel cage Induction generator, Wound rotor Induction generator- Optislip Induction generator- Doubly-fed Induction generator. Synchronous generator- Wound rotor generator- Permanent magnet generator, Indian standards |                                          |                  |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



|                         |                                                                                                                                                                                                                                                                                                                                     |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>      | 1. Rai. G.D. "Non-Conventional Sources of Energy", Khanna Publishers, New Delhi, 2002.<br>2. Chetan Singh Solanki, 'Solar Photovoltaics: Fundamentals, Technologies, Applications' PHI Learning Publications, 2nd Edition, 2011.                                                                                                    |
| <b>Reference Books:</b> | 1. Solanki, C.S. "Solar Photovoltaic Technology and Systems", PHI learning Pvt. Ltd., New Delhi, 2013.<br>2. S N Bhadra, S Banerjee and D Kastha, 'Wind Electrical Systems', Oxford University Press, 1st Edition, 2005.<br>3. S. Sumathi, L. Ashok Kumar, P. Surekha, 'Solar PV and Wind Energy Conversion Systems', Springer 2015 |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                   | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand the fundamental concepts and significance of solar energy.             | Understand (K2)      |
| <b>CO2</b>                                                | Analyze the performance characteristics of solar cells under various conditions.  | Analyze (K4)         |
| <b>CO3</b>                                                | Design and evaluate photovoltaic systems for practical applications.              | Evaluate (K5)        |
| <b>CO4</b>                                                | Describe the basic principles and potential of wind energy as a renewable source. | Understand (K2)      |
| <b>CO5</b>                                                | Compare and assess different wind energy conversion devices.                      | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | 2   | 1   | 1   | -   | -   | -   | -   | 1    | -    | 1    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 3   | 2   | 1   | -   | -   | -   | -   | 1    | -    | 1    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 3   | 2   | 1   | -   | -   | -   | -   | 1    | -    | 1    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | -   | 1    | -    | 1    | -    | -    | -    |
| <b>CO5</b>  | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | -   | 1    | -    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. R.P.Bhatnagar General English for Competitive Examinations. Macmillan India Limited, 2009.                                                                                                                                                                                                                                                                                                                                                              |
| <b>Reference Books:</b>    | 1. Educational Testing Service the Official Guide to the GRE Revised General Test, Tata McGraw Hill, 2010.<br>2. The Official Guide to the TOEFL Test, Tata McGraw Hill, 2010.<br>3. R Rajagopalan- General English for Competitive Examinations, McGraw Hill Education (India) Private Limited, 2008.                                                                                                                                                     |
| <b>MOOC/Web Platforms:</b> | <a href="http://www.examenglish.com">http://www.examenglish.com</a><br><a href="http://www.ets.org/">http://www.ets.org/</a><br><a href="http://www.bankxams.com/">http://www.bankxams.com/</a><br><a href="http://civilservicesmentor.com">http://civilservicesmentor.com</a><br><a href="http://www.educationobserver.com">http://www.educationobserver.com</a><br><a href="http://www.cambridgeenglish.org/in/">http://www.cambridgeenglish.org/in/</a> |

## IV - Course Outcome

| On completion of the course, the students will be able to |                                                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Expand their vocabulary and gain practical techniques to read and comprehend a wide range of texts with the emphasis required. | Understand (K2)      |
| <b>CO2</b>                                                | Identify errors with precision and write with clarity and coherence.                                                           | Analyze (K4)         |
| <b>CO3</b>                                                | Understand the importance of task fulfilment and the usage of task-appropriate vocabulary.                                     | Understand (K2)      |
| <b>CO4</b>                                                | Communicate effectively in group discussions, presentations and interviews.                                                    | Apply (K3)           |
| <b>CO5</b>                                                | Write topic-based essays with precision and accuracy.                                                                          | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |
| CO2         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |
| CO3         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |
| CO4         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |
| CO5         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401

**I - Course Name: 23OME01 - Energy Conservation and Management**

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                      |
|---|----------------------------------------------------------------------|
| 1 | To understand and analyse the Energy Data of Industries              |
| 2 | To carryout energy accounting and balancing                          |
| 3 | To conduct energy audit and suggest methodologies for energy savings |
| 4 | To utilize the available resources in optimal ways                   |
| 5 | To understand the energy economics                                   |

**III - Course Content**

| Unit – I                                                                                                                                                                                                                                                                                                                | INTRODUCTION                           | 9 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------|
| Energy - Power – Past & Present scenario of World; National Energy consumption Data Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.                                                        |                                        |           |
| Unit – II                                                                                                                                                                                                                                                                                                               | ELECTRICAL SYSTEMS                     | 9 Periods |
| Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination. |                                        |           |
| Unit – III                                                                                                                                                                                                                                                                                                              | THERMAL SYSTEMS                        | 9 Periods |
| Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution & Usage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories                                                                                               |                                        |           |
| Unit – IV                                                                                                                                                                                                                                                                                                               | ENERGY CONSERVATION IN MAJOR UTILITIES | 9 Periods |
| Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems –Cooling Towers – D.G. sets                                                                                                                                                                                                    |                                        |           |
| Unit – V                                                                                                                                                                                                                                                                                                                | ECONOMICS                              | 9 Periods |
| Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept                                                                                                                                                                                          |                                        |           |

**Total: 45 Periods**

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Energy Manager Training Manual (4 Volumes) available at <a href="http://www.energymanagertraining.com">www.energymanagertraining.com</a> . a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.                                                                                                                                                                                           |
| <b>Reference Books:</b>    | 1. Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.<br>2. Callaghn, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981.<br>3. Dryden. I.G.C., "The Efficient Use of Energy" Butterworths, London, 1982<br>4. Turner. W.C., "Energy Management Hand book", Wiley, New York, 1982.<br>5. Murphy. W.R. and G. Mc KAY, "Energy Management", Butterworths, London 1987 |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.npcindia.gov.in/NPC/Homes1/e-learning/course?category=MTc=">https://www.npcindia.gov.in/NPC/Homes1/e-learning/course?category=MTc=</a><br><a href="https://www.tpctraining.com/collections/energy-conservation-training">https://www.tpctraining.com/collections/energy-conservation-training</a>                                                                                                                                                    |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                          | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Remember the knowledge for Basic combustion and furnace design and selection of thermal and mechanical energy equipment. | Understand (K2)      |
| CO2                                                       | Study the Importance of Stoichiometry relations, Theoretical air required for complete combustion.                       | Understand (K2)      |
| CO3                                                       | Apply calculation and design tube still heaters.                                                                         | Apply (K3)           |
| CO4                                                       | Study the different heat treatment furnace, Practical and theoretical knowledge burner design.                           | Apply (K3)           |
| CO5                                                       | Apply economic evaluation technique.                                                                                     | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | -   | 1   | -   | 1   | -   | 1   | -   | 1   | 1    | -    | 1    | -    | -    | -    |
| CO2         | 3   | -   | 1   | -   | 1   | -   | 1   | -   | 1   | 1    | -    | 1    | -    | -    | -    |
| CO3         | 3   | -   | 1   | -   | 1   | -   | 1   | -   | 1   | 1    | -    | 1    | -    | -    | -    |
| CO4         | 3   | -   | 2   | -   | 1   | -   | 1   | -   | 1   | 1    | -    | 1    | -    | -    | -    |
| CO5         | 3   | -   | 3   | -   | 3   | -   | 1   | -   | 1   | 1    | -    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OME02 - Energy Technology

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                         |
|---|---------------------------------------------------------|
| 1 | To Understand energy resources and energy consumption   |
| 2 | To Understand Conventional energy resources             |
| 3 | To study Solar energy, Wind energy                      |
| 4 | To Learn Biomass energy resources                       |
| 5 | To Learn Energy conservation in chemical process plants |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | INTRODUCTION            | 8 Periods  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------|
| Units of energy, conversion factors, general classification of energy, world energy resources and energy consumption, Indian energy resources and energy consumption, energy crisis, energy alternatives, Renewable and non-renewable energy sources and their availability. Prospects of Renewable energy sources                                                                                                                                                                                                                                              |                         |            |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CONVENTIONAL ENERGY     | 8 Periods  |
| Conventional energy resources, Thermal, hydel and nuclear reactors, thermal, hydel and nuclear power plants, efficiency, merits and demerits of the above power plants, combustion processes, fluidized bed combustion.                                                                                                                                                                                                                                                                                                                                         |                         |            |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NON-CONVENTIONAL ENERGY | 10 Periods |
| Solar energy, solar thermal systems, flat plate collectors, focusing collectors, solar water heating, solar cooling, solar distillation, solar refrigeration, solar dryers, solar pond, solar thermal power generation, solar energy application in India, energy plantations. Wind energy, types of windmills, types of wind rotors, Darrieus rotor and Gravian rotor, wind electric power generation, wind power in India, economics of wind farm, ocean wave energy conversion, ocean thermal energy conversion, tidal energy conversion, geothermal energy. |                         |            |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | BIOMASS ENERGY          | 10 Periods |
| Biomass energy resources, thermo-chemical and biochemical methods of biomass conversion, combustion, gasification, pyrolysis, biogas production, ethanol, fuel cells, alkaline fuel cell, phosphoric acid fuel cell, molten carbonate fuel cell, solid oxide fuel cell, solid polymer electrolyte fuel cell, magneto hydrodynamic power generation, energy storage routes like thermal energy storage, chemical, mechanical storage and electrical storage.                                                                                                     |                         |            |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ENERGY CONSERVATION     | 9 Periods  |
| Energy conservation in chemical process plants, energy audit, energy saving in heat exchangers, distillation columns, dryers, ovens and furnaces and boilers, steam economy in chemical plants, energy conservation.                                                                                                                                                                                                                                                                                                                                            |                         |            |

Total: 45 Periods

Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Rao, S. and Parulekar, B.B., Energy Technology, Khanna Publishers, 2005.<br>2. Rai, G.D., Non-conventional Energy Sources, Khanna Publishers, New Delhi, 1984. 3. Bansal, N.K., Kleeman, M. and Meliss, M., Renewable Energy Sources and Conversion Technology, Tata McGraw Hill, 1990.<br>4. Nagpal, G.R., Power Plant Engineering, Khanna Publishers, 2008.                        |
| <b>Reference Books:</b>    | 1. Nejat Veziroglu, Alternate Energy Sources, IT, McGraw Hill, New York.<br>2. El. Wakil, Power Plant Technology, Tata McGraw Hill, New York, 2002.<br>3. Sukhatme. S.P., Solar Energy - Thermal Collection and Storage, Tata McGraw hill, New Delhi, 1981.                                                                                                                             |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.coursera.org/courses?query=renewable%20energy">https://www.coursera.org/courses?query=renewable%20energy</a><br><a href="https://onlinecourses.nptel.ac.in/noc25_ge53/preview">https://onlinecourses.nptel.ac.in/noc25_ge53/preview</a><br><a href="https://www.renewableinstitute.org/training-courses/">https://www.renewableinstitute.org/training-courses/</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Students will be able to describe the fundamentals and main characteristics of renewable energy sources and their differences compared to fossil fuels.                                                       | Understand (K2)      |
| CO2                                                       | Students will excel as professionals in the various fields of energy engineering                                                                                                                              | Understand (K2)      |
| CO3                                                       | Compare different renewable energy technologies and choose the most appropriate based on local conditions.                                                                                                    | Apply (K3)           |
| CO4                                                       | Explain the technological basis for harnessing renewable energy sources.                                                                                                                                      | Apply (K3)           |
| CO5                                                       | Identify and critically evaluate current developments and emerging trends within the field of renewable energy technologies and to develop in-depth technical understanding of energy problems at an advanced | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | -   | 1   | -   | 1   | -   | 1   | -   | 1   | 1    | -    | 1    | -    | -    | -    |
| CO2         | 3   | -   | 1   | -   | 1   | -   | 1   | -   | 1   | 1    | -    | 1    | -    | -    | -    |
| CO3         | 3   | -   | 1   | -   | 1   | -   | 1   | -   | 1   | 1    | -    | 1    | -    | -    | -    |
| CO4         | 3   | -   | 2   | -   | 1   | -   | 1   | -   | 1   | 1    | -    | 1    | -    | -    | -    |
| CO5         | 3   | -   | 3   | -   | 3   | -   | 1   | -   | 1   | 1    | -    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OME03 - Engineering Graphics Design

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                  |
|---|------------------------------------------------------------------|
| 1 | Drawing engineering curves.                                      |
| 2 | Drawing freehand sketch of simple objects.                       |
| 3 | Drawing orthographic projection of solids and section of solids. |
| 4 | Drawing development of solids                                    |
| 5 | Drawing isometric and perspective projections of simple solids   |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                              | PLANE CURVES                                               | 9 Periods |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-----------|
| Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.                                                                                                                               |                                                            |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                             | PROJECTION OF POINTS, LINES AND PLANE SURFACE              | 9 Periods |
| Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method. |                                                            |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                            | PROJECTION OF SOLIDS AND FREEHAND SKETCHING                | 9 Periods |
| Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.   |                                                            |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                             | PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES | 9 Periods |
| Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones.                                                                                                                 |                                                            |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                              | ISOMETRIC AND PERSPECTIVE PROJECTIONS                      | 9 Periods |
| Principles of isometric projection — isometric scale - Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method. Practicing                                                                                      |                                                            |           |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019                                                                                                                                                                                                                               |
| <b>Reference Books:</b>    | 1. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.<br>2. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015<br>3. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.                          |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc21_me128/preview">https://onlinecourses.nptel.ac.in/noc21_me128/preview</a><br><a href="https://www.mygreatlearning.com/academy/learn-for-free/courses/engineering-graphics-drawing">https://www.mygreatlearning.com/academy/learn-for-free/courses/engineering-graphics-drawing</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Use BIS conventions and specifications for engineering drawing.                | Understand (K2)      |
| <b>CO2</b>                                                | Construct the conic curves, involutes and cycloid.                             | Understand (K2)      |
| <b>CO3</b>                                                | Solve practical problems involving projection of lines.                        | Apply (K3)           |
| <b>CO4</b>                                                | Draw the orthographic, isometric and perspective projections of simple solids. | Apply (K3)           |
| <b>CO5</b>                                                | Draw the development of simple solids.                                         | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 1   | 2   | -   | 2   | -   | -   | -   | -   | 3    | -    | 2    | -    | 1    | -    |
| <b>CO2</b>  | 3   | 1   | 2   | -   | 2   | -   | -   | -   | -   | 3    | -    | 2    | -    | 1    | -    |
| <b>CO3</b>  | 3   | 1   | 2   | -   | 2   | -   | -   | -   | -   | 3    | -    | 2    | -    | 1    | -    |
| <b>CO4</b>  | 3   | 1   | 2   | -   | 2   | -   | -   | -   | -   | 3    | -    | 2    | -    | 1    | -    |
| <b>CO5</b>  | 3   | 1   | 2   | -   | 2   | -   | -   | -   | -   | 3    | -    | 2    | -    | 1    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401



## I - Course Name: 23OME04 - Foundation of Robotics

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                       |
|---|-------------------------------------------------------------------------------------------------------|
| 1 | To study the kinematics, drive systems and programming of robots.                                     |
| 2 | To study the basics of robot laws and transmission systems.                                           |
| 3 | To familiarize students with the concepts and techniques of robot manipulator, its kinematics.        |
| 4 | To familiarize students with the various Programming and Machine Vision application in robots.        |
| 5 | To build confidence among students to evaluate, choose and incorporate robots in engineering systems. |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | FUNDAMENTALS OF ROBOT                 | 9 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------|
| Robot – Definition – Robot Anatomy – Co-ordinate systems, Work Envelope, types and classification – specifications – Pitch, yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and their functions – Need for Robots – Different Applications.- Industrial Robot Types and Their Applications in Automotive Manufacturing.                                                                                                                                                                                                                                                                             |                                       |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ROBOT KINEMATICS                      | 9 Periods |
| Forward kinematics, inverse kinematics and the difference: forward kinematics and inverse .Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – derivations and problems. Homogeneous transformation matrices, translation and rotation matrices. Industrial Implementation of Multi-DOF Robots in Precision Machining.                                                                                                                                                                                                                       |                                       |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ROBOT DRIVE SYSTEMS AND END EFFECTORS | 9 Periods |
| Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of All These Drives. End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic grippers, vacuum grippers, internal grippers and external grippers, selection and design considerations of a gripper- Selection Criteria for End Effectors in Automated Packaging Systems.                                                                                                                            |                                       |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SENSORS IN ROBOTICS                   | 9 Periods |
| Force sensors, touch and tactile sensors, proximity sensors, non-contact sensors, safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism. Machine vision system - camera, frame grabber, sensing and digitizing image data – signal conversion, image storage, lighting techniques, image processing and analysis – data reduction, segmentation, feature extraction, object recognition, other algorithms, applications –Inspection, identification, visual serving and navigation. Proximity Sensors in Automated Guided Vehicles (AGVs) for Warehousing |                                       |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | PROGRAMMING AND APPLICATIONS OF ROBOT | 9 Periods |
| Teach pendant programming, lead through programming, robot programming languages – VAL programming – Motion Commands, Sensors commands, End-Effector Commands, and simple programs - Role of robots in inspection, assembly, material handling, underwater, space and medical fields. Application of Robots in Inspection and Quality Assurance in Electronics Manufacturing.                                                                                                                                                                                                                                           |                                       |           |

Chairperson-Board of Studies,  
Department of Information Technology,  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

Total: 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Ganesh.S.Hedge, "A textbook of Industrial Robotics", Lakshmi Publications, 2006.<br>2. Mikell.P.Groover, "Industrial Robotics – Technology, Programming and applications" McGraw Hill 2 <sup>ND</sup> edition 2012.                                                                                                                                                       |
| <b>Reference Books:</b>    | 1. Fu K.S. Gonzalez R.C. and Lee C.S.G. "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill book co. 2007.<br>2. Yoram Koren, "Robotics for Engineers", McGraw Hill Book, Co., 2002.<br>3. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill 2005.<br>4. John. J.Craig, "Introduction to Robotics: Mechanics and Control" 2nd Edition, 2002. |
| <b>MOOC/Web Platforms:</b> | <a href="https://onlinecourses.nptel.ac.in/noc20_me92/preview">https://onlinecourses.nptel.ac.in/noc20_me92/preview</a><br><a href="https://nptel.ac.in/courses/107106090">https://nptel.ac.in/courses/107106090</a>                                                                                                                                                         |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Interpret the features of robots and technology involved in the control.                                                                                                           | Understand (K2)      |
| <b>CO2</b>                                                | Apply the basic engineering knowledge and laws for the design of robotics.                                                                                                         | Apply (K3)           |
| <b>CO3</b>                                                | Explain the basic concepts like various configurations, classification and parts of end effectors compare various end effectors and grippers and tools and sensors used in robots. | Understand (K2)      |
| <b>CO4</b>                                                | Explain the concept of kinematics, degeneracy, dexterity and trajectory planning.                                                                                                  | Understand (K2)      |
| <b>CO5</b>                                                | Demonstrate the image processing and image analysis techniques by machine vision                                                                                                   | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |
| <b>CO2</b>  | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |
| <b>CO3</b>  | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |
| <b>CO4</b>  | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |
| <b>CO5</b>  | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OME05 - Industrial Design &amp; Rapid Prototyping Techniques

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                       |
|---|-------------------------------------------------------------------------------------------------------|
| 1 | Understand the fundamentals of user interface (UI) and user experience (UX) design principles.        |
| 2 | Gain foundational knowledge of mobile and web application architecture.                               |
| 3 | Use tools like CAD software to create digital mockups of industrial designs.                          |
| 4 | Learn various mechanical fabrication methods including 3D printing, laser cutting, and CNC machining. |
| 5 | Learn the fundamentals of electronic prototyping and embedded systems.                                |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                          | UI/UX                        | 9 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------|
| Fundamental concepts in UI & UX - Tools - Fundamentals of design principles - Psychology and Human Factors for User Interface Design - Layout and composition for Web, Mobile and Devices - Typography - Information architecture - Color theory - Design process flow, wireframes, best practices in the industry - User engagement ethics - Design alternatives |                              |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                         | APP DEVELOPMENT              | 9 Periods |
| SDLC - Introduction to App Development - Types of Apps - web Development - understanding Stack - Frontend - backend - Working with Databases - Introduction to API - Introduction to Cloud services - Cloud environment Setup- Reading and writing data to cloud - Embedding ML models to Apps - Deploying application.                                           |                              |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                        | INDUSTRIAL DESIGN            | 9 Periods |
| Introduction to Industrial Design - Points, lines, and planes - Sketching and concept generation - Sketch to CAD - Introduction to CAD tools - Types of 3D modeling - Basic 3D Modeling Tools - Part creation – Assembly - Product design and rendering basics - Dimensioning & Tolerancing                                                                       |                              |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                         | MECHANICAL RAPID PROTOTYPING | 9 Periods |
| Need for prototyping - Domains in prototyping - Difference between actual manufacturing and prototyping - Rapid prototyping methods - Tools used in different domains - Mechanical Prototyping; 3D Printing and classification - Laser Cutting and engraving - RD Works - Additive manufacturing                                                                  |                              |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                          | ELECTRONIC RAPID PROTOTYPING | 9 Periods |
| Basics of electronic circuit design - lumped circuits - Electronic Prototyping - Working with simulation tool - simple PCB design with EDA                                                                                                                                                                                                                        |                              |           |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Peter Fiell, Charlotte Fiell, Industrial Design A-Z, TASCHEN America Llc(2003)<br>2. Samar Malik, Autodesk Fusion 360 - The Master Guide.<br>3. Steve Krug, Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability, Pearson, 3rd edition (2014)                                                                                 |
| <b>Reference Books:</b>    | 1. Rapid Product Development- Synergic integration of time-compression technologies K. P. Karunakaran, V. P. Bapat, Sreenath Babu Akula P. D. Solanki Gaurav Gupta, V.R. Prasanth, Saket Anand, Arnab Sarkar and S. Venkatkrishnan<br>2. Manufacturing Processes for Engineering Materials -Serope Kalpakjian and Steven R. Schmid Pearson Education |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel/courses/video/112105126/L01.html">https:// nptel/courses/video/112105126/L01.html</a>                                                                                                                                                                                                                                         |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Create quick UI/UX prototypes for customer needs                             | Understand (K2)      |
| <b>CO2</b>                                                | Develop web application to test product traction / product feature           | Apply (K3)           |
| <b>CO3</b>                                                | Develop 3D models for prototyping various product ideas                      | Apply (K3)           |
| <b>CO4</b>                                                | Built prototypes using Tools and Techniques in a quick iterative methodology | Apply (K3)           |
| <b>CO5</b>                                                | To develop the electronic prototyping with simulation                        | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO2</b>  | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO3</b>  | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO4</b>  | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO5</b>  | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23OME06 - Industrial Management**

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                             |
|---|-------------------------------------------------------------|
| 1 | To introduce fundamental concepts of industrial management. |
| 2 | To understand the approaches to the study of Management.    |
| 3 | To learn about Decision Making, Organizing and leadership.  |
| 4 | To analyze the Managerial Role and functions.               |
| 5 | To know about the Supply Chain Management.                  |

**III - Course Content**

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | INTRODUCTION             | 9 Periods |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------|
| Technology Management - Definition - Functions - Evolution of Modern Management - Scientific Management Development of Management Thought. Approaches to the study of Management, Forms of Organization -Individual Ownership - Partnership - Joint Stock Companies - Co-operative Enterprises - Public Sector Undertakings, Corporate Frame Work- Share Holders - Board of Directors - Committees - Chief Executive Line and Functional Managers,-Financial-Legal-Trade Union.                                                                                                                    |                          |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | FUNCTIONS OF MANAGEMENT  | 9 Periods |
| Planning - Nature and Purpose - Objectives - Strategies – Policies and Planning Premises - Decision Making - Organizing - Nature and Process - Premises - Departmentalization - Line and staff - Decentralization - Organizational culture, Staffing - selection and training .Placement - Performance appraisal - Career Strategy – Organizational Development. Leading - Managing human factor - Leadership .Communication, Controlling - Process of Controlling - Controlling techniques, productivity and operations management - Preventive control, Industrial Safety.                       |                          |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ORGANIZATIONAL BEHAVIOUR | 9 Periods |
| Definition - Organization - Managerial Role and functions -Organizational approaches, Individual behaviour - causes - Environmental Effect - Behaviour and Performance, Perception - Organizational Implications. Personality - Contributing factors - Dimension – Need Theories - Process Theories - Job Satisfaction, Learning and Behaviour-Learning Curves, Work Design and approaches.                                                                                                                                                                                                        |                          |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | GROUP DYNAMICS           | 9 Periods |
| Group Behaviour - Groups - Contributing factors - Group Norms, Communication - Process - Barriers to communication - Effective communication, leadership - formal and informal characteristics – Managerial Grid - Leadership styles - Group Decision Making - Leadership Role in Group Decision, Group Conflicts - Types -Causes - Conflict Resolution -Inter group relations and conflict, Organization centralization and decentralization - Formal and informal - Organizational Structures Organizational Change and Development -Change Process – Resistance to Change - Culture and Ethics. |                          |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MODERN CONCEPTS          | 9 Periods |
| Management by Objectives (MBO) - Management by Exception (MBE),Strategic Management - Planning for Future direction - SWOT Analysis -Evolving development strategies, information technology in management Decisions support system-Management Games Business Process Reengineering(BPR) –Enterprises Resource Planning (ERP) - Supply Chain Management (SCM) - Activity Based Management (AM) - Global Perspective - Principles and Steps Advantages and disadvantage                                                                                                                             |                          |           |

|                            |                                                                                                                                                                                                                                                  |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Maynard H.B, "Industrial Engineering Hand book", McGraw-Hill, sixth 2008                                                                                                                                                                      |
| <b>Reference Books:</b>    | 1. S.Chandran, "Organizational Behaviours", Vikas Publishing House Pvt. Ltd., 1994                                                                                                                                                               |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.udemy.com/course/industrial-management/">https://www.udemy.com/course/industrial-management/</a><br><a href="https://onlinecourses.nptel.ac.in/noc22_me04/preview">https://onlinecourses.nptel.ac.in/noc22_me04/preview</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                                                                     | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Explain basic concepts of management; approaches to management; contributors to management studies; various forms of business organization and trade unions function in professional organizations. | Understand (K2)      |
| <b>CO2</b>                                                | Discuss the planning; organizing and staffing functions of management in professional organization.                                                                                                 | Understand (K2)      |
| <b>CO3</b>                                                | Apply the leading; controlling and decision-making functions of management in professional organization.                                                                                            | Apply (K3)           |
| <b>CO4</b>                                                | Discuss the organizational theory in professional organization.                                                                                                                                     | Understand (K2)      |
| <b>CO5</b>                                                | Apply principles of productivity and modern concepts in management in professional organization.                                                                                                    | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO2</b>  | -   | 3   | 2   | 3   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO3</b>  | 2   | 3   | 2   | 3   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO4</b>  | 2   | 2   | 3   | 3   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| <b>CO5</b>  | 2   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OME07 - Industrial Safety and Hazard Management

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| 1 | To Understand the Introduction and basic Terminologies safety.                               |
| 2 | To enable the students to learn about the Important Statutory Regulations and standards.     |
| 3 | To enable students to Conduct and participate the various Safety activities in the industry. |
| 4 | To have knowledge about Workplace Exposures and Hazards.                                     |
| 5 | To assess the various Hazards and consequences through various Risk Assessment Techniques.   |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                               | SAFETY TERMINOLOGIES             | 9 Periods |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------|
| Hazard-Types of Hazard- Risk-Hierarchy of Hazards Control Measures-Lead indicators- lag Indicators- Flammability- Toxicity Time-weighted Average (TWA) - Threshold Limit Value (TLV) - Short Term Exposure Limit (STEL)- Immediately dangerous to life or health (IDLH)- acute and chronic Effects- Routes of Chemical Entry-Personnel Protective Equipment- Health and Safety Policy-Material Safety Data Sheet-MSDS. |                                  |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                              | STANDARDS AND REGULATIONS        | 9 Periods |
| Indian Factories Act-1948- Health- Safety- Hazardous materials and Welfare- ISO 45001:2018 occupational health and safety (OH&S) - Occupational Safety and Health Audit IS14489:1998- Hazard Identification and Risk Analysis- code of practice IS 15656:2006.                                                                                                                                                         |                                  |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                             | SAFETY ACTIVITIES                | 9 Periods |
| Toolbox Talk- Role of safety Committee- Responsibilities of Safety Officers and Safety Representatives- Safety Training and Safety Incentives- Mock Drills- On-site Emergency Action Plan- Off-site Emergency Action Plan- Safety poster and Display- Human Error Assessment.                                                                                                                                          |                                  |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                              | WORKPLACE HEALTH AND SAFETY      | 9 Periods |
| Noise hazard- Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA- Unsafe act & Unsafe Condition- Electrical Hazards- Crane Safety - Toxic gas Release.                                                                                                                                                                                                            |                                  |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                               | HAZARD IDENTIFICATION TECHNIQUES | 9 Periods |
| Job Safety Analysis-Preliminary Hazard Analysis-Failure mode and Effects Analysis- Hazard and Operability- Fault Tree Analysis- Event Tree Analysis Qualitative and Quantitative Risk Assessment - Checklist Analysis- Root cause analysis- What-If Analysis- and Hazard Identification and Risk Assessment.                                                                                                           |                                  |           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. R.K. Jain and Prof. Sunil S. Rao Industrial Safety, Health and Environment Management Systems KHANNA PUBLISHER<br>2. L. M. Deshmukh Industrial Safety Management: Hazard Identification and Risk Control McGraw-Hill Education.                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Reference Books:</b>    | 1. Frank Lees (2012) 'Lees' Loss Prevention in Process Industries. Butterworth-Heinemann publications, UK, 4th Edition.<br>2. John Ridley & John Channing (2008) Safety at Work: Routledge, 7th Edition.<br>3. Dan Petersen (2003) Techniques of Safety Management: A System Approach.<br>4. Alan Waring (1996) Safety management system: Chapman & Hall, England<br>5. Society of Safety Engineers, USA.                                                                                                                                                                                                                                      |
| <b>MOOC/Web Platforms:</b> | ISO 45001:2018 occupational health and safety (OH&S) International Organization for Standardization <a href="https://www.iso.org/standard/63787.html">https://www.iso.org/standard/63787.html</a><br>Indian Standard code of practice on occupational safety and health audit <a href="https://law.resource.org/pub/in/bis/S02/is.14489.1998.pdf">https://law.resource.org/pub/in/bis/S02/is.14489.1998.pdf</a><br>Indian Standard code of practice on Hazard Identification and Risk Analysis IS 15656:2006 <a href="https://law.resource.org/pub/in/bis/S02/is.15656.2006.pdf">https://law.resource.org/pub/in/bis/S02/is.15656.2006.pdf</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                     | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the basic concept of safety.                             | Understand (K2)      |
| CO2                                                       | Obtain knowledge of Statutory Regulations and standards.            | Apply (K3)           |
| CO3                                                       | Know about the safety Activities of the working place.              | Apply (K3)           |
| CO4                                                       | Analyze on the impact of Occupational Exposures and their Remedies. | Analyze (K4)         |
| CO5                                                       | Obtain knowledge of Risk Assessment Techniques.                     | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | 1   | 1   | 3   | 2   | 2   | 3   | 3    | 1    | 3    | -    | -    | -    |
| CO2         | 2   | 3   | 2   | 2   | 1   | 3   | 2   | 3   | 3   | 2    | 1    | 3    | -    | -    | -    |
| CO3         | 2   | 2   | 2   | 2   | 1   | 2   | 2   | 2   | 3   | 2    | 1    | 2    | -    | -    | -    |
| CO4         | 3   | 3   | 3   | 2   | 2   | 3   | 2   | 2   | 3   | 2    | 2    | 3    | -    | -    | -    |
| CO5         | 3   | 2   | 3   | 2   | 2   | 3   | 2   | 2   | 3   | 2    | 2    | 3    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OME08 - Introduction to Industrial Automation Systems

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                |
|---|--------------------------------------------------------------------------------|
| 1 | To educate on design of signal conditioning circuits for various applications. |
| 2 | To Introduce signal transmission techniques and their design.                  |
| 3 | Study of components used in data acquisition systems interface techniques      |
| 4 | To educate on the components used in distributed control systems               |
| 5 | To introduce the communication buses used in automation industries.            |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | INTRODUCTION                                   | 9 Periods |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------|
| Automation overview, Requirement of automation systems, Architecture of Industrial Automation system, Introduction of PLC and supervisory control and data acquisition (SCADA). Industrial bus systems : Modbus & Profibus                                                                                                                                                                                                                                                       |                                                |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | AUTOMATION COMPONENTS                          | 9 Periods |
| Sensors for temperature, pressure, force, displacement, speed, flow, level, humidity and pH measurement. Actuators, process control valves, power electronics devices DIAC, TRIAC, power MOSFET and IGBT. Introduction of DC and AC servo drives for motion control- Industrial Internet of Things (IIoT) Enabled Sensors and Actuators                                                                                                                                          |                                                |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | COMPUTER AIDED MEASUREMENT AND CONTROL SYSTEMS | 9 Periods |
| Role of computers in measurement and control, Elements of computer aided measurement and control, man machine interface, computer aided process control hardware, process related interfaces, Communication and networking, Industrial communication systems, Data transfer techniques, Computer aided process control software, Computer based data acquisition system, Internet of things (IoT) for plant automation- Digital Twin Technology for Real-Time Process Monitoring |                                                |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | PROGRAMMABLE LOGIC CONTROLLERS                 | 9 Periods |
| Programmable controllers, Programmable logic controllers, Analog digital input and output modules, PLC programming, Ladder diagram, Sequential flow chart, PLC Communication and networking, PLC selection, PLC Installation, Advantage of using PLC for Industrial automation, Application of PLC to process control industries- Networked PLC Systems for Industry 4.0                                                                                                         |                                                |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | DISTRIBUTED CONTROL SYSTEM                     | 9 Periods |
| Overview of nanomaterials properties and their applications, nano painting, nano coating, nanomaterials for renewable energy, Molecular Electronics and Nanoelectronics – Nanobots- Biological Applications. Emerging technologies for environmental applications- Practice of nanoparticles for environmental remediation and water treatment-Nanotechnology in Environmental Remediation- Cybersecurity in Distributed Control Systems                                         |                                                |           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1.S.K.Singh, "Industrial Instrumentation", Tata Mcgraw Hill, 2nd edition companies,2003.<br>2. C D Johnson, "Process Control Instrumentation Technology", Prentice Hall India,8th Edition, 2006.<br>3. E.A.Parr, Newnes ,NewDelhi,"Industrial Control Handbook",3rd Edition, 2000.                                                                                                                                                                                          |
| <b>Reference Books:</b>    | 1.John W. Webb and Ronald A. Reis, "Programmable Logic Controllers: Principles and Applications", 5th Edition, Prentice Hall Inc., New Jersey, 2003.<br>2. Frank D. Petruzella, "Programmable Logic Controllers", 5th Edition, McGraw- Hill, New York, 2016.<br>3. Krishna Kant, "Computer - Based Industrial Control", 2nd Edition, Prentice Hall, New Delhi, 2011.<br>4. Gary Dunning, Thomson Delmar,"Programmable Logic Controller", CeneageLearning, 3rd Edition,2005. |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/108105062">nptel.ac.in/courses/108105062</a>                                                                                                                                                                                                                                                                                                                                                                                           |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                               | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Design a signal conditioning circuits for various application.                                                                                | Understand (K2)      |
| <b>CO2</b>                                                | Acquire a detail knowledge on data acquisition system interface and DCS system.                                                               | Apply (K3)           |
| <b>CO3</b>                                                | Understand the basics and Importance of communication buses in applied automation engineering.                                                | Understand (K2)      |
| <b>CO4</b>                                                | Ability to design PLC Programmes by Applying Timer/Counter and Arithmetic and Logic Instructions Studied for Ladder Logic and Function Block. | Apply (K3)           |
| <b>CO5</b>                                                | Able to develop a PLC logic for a specific application on real world problem.                                                                 | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 2   | 3   | 2   | 3   | 3   | -   | -   | 1   | 1   | 3    | 1    | 1    | -    | -    | -    |
| <b>CO2</b>  | 2   | 3   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO3</b>  | 2   | 2   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO4</b>  | 2   | 2   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO5</b>  | 2   | 2   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OME09 - Introduction to Non- Destructive Testing

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                       |
|---|-----------------------------------------------------------------------------------------------------------------------|
| 1 | Understanding the basic importance of NDT in quality assurance.                                                       |
| 2 | Imbibing the basic principles of various NDT techniques, its applications, limitations, codes and standards.          |
| 3 | Equipping themselves to locate a flaw in various materials, products.                                                 |
| 4 | Applying apply the testing methods for inspecting materials in accordance with industry specifications and standards. |
| 5 | Acquiring the knowledge on the selection of the suitable NDT technique for a given application.                       |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | INTRODUCTION TO NDT & VISUAL TESTING         | 9 Periods |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------|
| Concepts of Non-destructive testing-relative merits and limitations-NDT Versus mechanical testing, Fundamentals of Visual Testing – vision, lighting, material attributes, environmental factors, visual perception, direct and indirect methods – mirrors, magnifiers, boroscopes and fibroscopes – light sources and special lighting-Real Case Studies: Examples from aerospace or petrochemical industries where visual testing prevented major failures.                                                                                                                                                                                                                                                                                      |                                              |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | LIQUID PENETRANT & MAGNETIC PARTICLE TESTING | 9 Periods |
| Liquid Penetrant Inspection: principle, applications, advantages and limitations, dyes, developers and cleaners, Methods & Interpretation. Magnetic Particle Inspection: Principles, applications, magnetization methods, magnetic particles, Testing Procedure, demagnetization, advantages and limitations, – Interpretation and evaluation of test indications-In-Process Inspection: Use of LPI/MPI in high-volume manufacturing – case from railways and aerospace sectors.                                                                                                                                                                                                                                                                   |                                              |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | EDDY CURRENT TESTING & THERMOGRAPHY          | 9 Periods |
| Eddy Current Testing: Generation of eddy currents– properties– eddy current sensing elements, probes, Instrumentation, Types of arrangement, applications, advantages, limitations – Factors affecting sensing elements and coil impedance, calibration, Interpretation/Evaluation. Thermography- Principle, Contact & Non-Contact inspection methods, Active & Passive methods, Liquid Crystal – Concept, example, advantages & limitations. Electromagnetic spectrum, infrared thermography- approaches, IR detectors, Instrumentation and methods, applications- Industry Use Cases: Case study of IR thermography in solar panel inspection and mechanical bearing faults.                                                                     |                                              |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ULTRASONIC TESTING & AET                     | 9 Periods |
| Ultrasonic Testing: Types of ultrasonic waves, characteristics, attenuation, couplants, probes, EMAT. Inspection methods-pulse echo, transmission and phased array techniques, types of scanning and displays, angle beam inspection of welds, time of flight diffraction (TOFD) technique, Thickness determination by ultrasonic method, Study of A, B and C scan presentations, calibration. Acoustic Emission Technique – Introduction, Types of AE signal, AE wave propagation, Source location, Kaiser effect, AE transducers, Principle, AE parameters, AE instrumentation, Advantages & Limitations, Interpretation of Results, AET Applications: Real-time monitoring in power plants, pressure vessels, and structural health monitoring. |                                              |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | RADIOGRAPHY TESTING                          | 9 Periods |
| Sources-X-rays and Gamma rays and their characteristics-absorption, scattering. Filters and screens, Imaging modalities-film radiography and digital radiography (Computed, Direct, Real Time, CT scan).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                              |           |



Problems in shadow formation, exposure factors, inverse square law, exposure charts, Penetrimeters, safety in radiography- Real-Time RT: Applications in automotive and pipeline inspections with automated image analysis.

**Total: 45 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Baldev Raj, T. Jayakumar and M. Thavasimuthu, Practical Non Destructive Testing, Alpha Science International Limited, 3rd edition, 2002.<br>2. J. Prasad and C. G. K. Nair, Non-Destructive Test and Evaluation of Materials, Tata McGraw- Hill Education, 2nd edition, 2011.<br>3. Ravi Prakash, "Non-Destructive Testing Techniques", 1st revised edition, New Age International Publishers, 2010. |
| <b>Reference Books:</b>    | 1. ASM Metals Handbook, V-17, "Nondestructive Evaluation and Quality Control", American Society of Metals, USA, 2001.<br>2. Barry Hull and Vernon John, "Nondestructive Testing", Macmillan, 1989.<br>3. Chuck Hellier, "Handbook of Nondestructive Evaluation", Mc Graw Hill, 2012.<br>4. Louis Cartz, "Nondestructive Testing", ASM International, USA, 1995.                                         |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/113106070">https://nptel.ac.in/courses/113106070</a><br><a href="https://onlinecourses.nptel.ac.in/noc25_mm29/preview">https://onlinecourses.nptel.ac.in/noc25_mm29/preview</a>                                                                                                                                                                                    |

#### IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Realize the importance of NDT in various engineering fields.                                                                                   | Understand (K2)      |
| <b>CO2</b>                                                | Have a basic knowledge of surface NDE techniques which enables to carry out various inspection in accordance with the established procedures.  | Understand (K2)      |
| <b>CO3</b>                                                | Calibrate the instrument and inspect for in-service damage in the components by means of Eddy current testing as well as Thermography testing. | Apply (K3)           |
| <b>CO4</b>                                                | Differentiate various techniques of UT and AET and select appropriate NDT methods for better evaluation.                                       | Understand (K2)      |
| <b>CO5</b>                                                | Interpret the results of Radiography testing and also have the ability to analyse the influence of various parameters on the testing.          | Apply (K3)           |

#### V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 2   | 2   | 2   | 3   | -   | -   | 2   | 2   | -   | -    | -    | 2    | -    | -    | -    |
| <b>CO2</b>  | 3   | 1   | 2   | 2   | -   | -   | 2   | 2   | -   | -    | -    | 2    | -    | -    | -    |
| <b>CO3</b>  | 3   | 2   | 1   | 2   | -   | -   | 2   | 2   | -   | -    | -    | 2    | -    | -    | -    |
| <b>CO4</b>  | 3   | 1   | 2   | 2   | -   | -   | 2   | 2   | -   | -    | -    | 2    | -    | -    | -    |
| <b>CO5</b>  | 3   | 2   | 2   | 2   | -   | -   | 2   | 2   | -   | -    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OME10 - Mechatronics

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                            |
|---|--------------------------------------------------------------------------------------------|
| 1 | To understand Mechatronics principles and sensor technologies.                             |
| 2 | To study the architecture and programming of 8085 microprocessor.                          |
| 3 | To interface peripherals using 8255 and implement basic control systems.                   |
| 4 | To develop PLC-based automation with timers, counters, and I/O handling.                   |
| 5 | To explore actuators and apply Mechatronics design methodology through real-world systems. |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                                 | <b>INTRODUCTION AND SENSORS</b>                 | <b>9 Periods</b> |
| Introduction to Mechatronics – Systems – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and Dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance Sensors – Strain Gauges – Eddy Current Sensor – Hall Effect Sensor – Temperature Sensors – Light Sensors.                                          |                                                 |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>8085 MICROPROCESSOR</b>                      | <b>9 Periods</b> |
| Introduction – Pin Configuration – Architecture of 8085 – Addressing Modes – Instruction set, Timing diagram of 8085.                                                                                                                                                                                                                                                                           |                                                 |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                               | <b>PROGRAMMABLE PERIPHERAL INTERFACE</b>        | <b>9 Periods</b> |
| Introduction – Architecture of 8255, Keyboard Interfacing, LED display – Interfacing, ADC and DAC Interface, Temperature Control – Stepper Motor Control – Traffic Control Interface.                                                                                                                                                                                                           |                                                 |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>PROGRAMMABLE LOGIC CONTROLLER</b>            | <b>9 Periods</b> |
| Introduction – Architecture – Input / Output Processing – Programming with Timers, Counters and Internal relays – Data Handling – Selection of PLC- Overview, Siemens PLC, Allen Bradley PLC, Schneider electric PLC, Omron PLC, Mitsubishi PLC. Their comparison of various instructions. PLC Applications.                                                                                    |                                                 |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                                 | <b>ACTUATORS AND MECHATRONICS SYSTEM DESIGN</b> | <b>9 Periods</b> |
| Types of Stepper and Servo motors – Construction – Working Principle – Characteristics, Stages of Mechatronics Design Process – Comparison of Traditional and Mechatronics Design Concepts with Examples – Case studies of Mechatronics Systems – Pick and Place Robot – Engine Management system – Automatic Car Park Barrier. Automatic Washing Machine, Auto focus camera, exposure control. |                                                 |                  |

Total: 45 Periods

|                            |                                                                                                                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Bolton W., "Mechatronics", Pearson Education, 6th Edition, 2015.<br>2. Ramesh S Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram International Publishing Private Limited, 6th Edition, 2013. |
| <b>Reference Books:</b>    | 1. Davis G. Alciatore and Michael B. Hstand, "Introduction to Mechatronics and Measurement systems", McGraw Hill Education, 2011.                                                                                                           |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/112107298">nptel.ac.in/courses/112107298</a>                                                                                                                                                           |

Chairperson-Board of Studies,

Department of Information Technology,  
NPR College of Engineering & Technology(Autonomous),  
Natham, Dindigul 624401

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                 | Bloom's Level Mapped |
|-----------------------------------------------------------|---------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain the role of Mechatronics and classify sensors based on applications.    | Understand (K2)      |
| CO2                                                       | Analyze the structure and functioning of the 8085 microprocessor.               | Analyze (K4)         |
| CO3                                                       | Design and interface microprocessor systems using PPI (8255).                   | Apply (K3)           |
| CO4                                                       | Develop basic PLC programs for industrial automation.                           | Apply (K3)           |
| CO5                                                       | Apply Mechatronics design processes using actuators and practical case studies. | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 2   | 2   | 1   | -   | -   | 1   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO2         | 3   | 3   | 2   | 1   | -   | -   | 1   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO3         | 3   | 3   | 2   | 1   | -   | -   | 1   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO4         | 3   | 3   | 2   | 1   | -   | -   | 1   | -   | -   | -    | -    | 2    | -    | -    | -    |
| CO5         | 3   | 3   | 2   | 1   | -   | -   | 1   | -   | -   | -    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OME11 - Nanomaterials and applications

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                                                          |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Understanding the evolution of nanomaterials in the scientific era and make them to understand different types of nanomaterials for the future engineering applications. |
| 2 | Gaining knowledge on dimensionality effects on different properties of nanomaterials.                                                                                    |
| 3 | Getting acquainted with the different processing techniques employed for fabricating nanomaterials.                                                                      |
| 4 | Having knowledge on the different characterization techniques employed to characterize the nanomaterials.                                                                |
| 5 | Acquiring knowledge on different applications of nanomaterials in different disciplines of engineering.                                                                  |

## III - Course Content

|                                                                                                                                                                                                                                                                                                    |                                                                  |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                    | <b>NANOMATERIALS</b>                                             | <b>9 Periods</b> |
| Introduction, Classification: 0D, 1D, 2D, 3D nanomaterials and nano-composites, their mechanical, electrical, optical, magnetic properties; Nanomaterials versus bulk materials.                                                                                                                   |                                                                  |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                   | <b>THERMODYNAMICS &amp; KINETICS OF NANOSTRUCTURED MATERIALS</b> | <b>9 Periods</b> |
| Size and interface/interphase effects, interfacial thermodynamics, phase diagrams, diffusivity, grain growth, and thermal stability of nanomaterials.                                                                                                                                              |                                                                  |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                  | <b>PROCESSING</b>                                                | <b>9 Periods</b> |
| Bottom-up and top-down approaches for the synthesis of nanomaterials, mechanical alloying, chemical routes, severe plastic deformation, and electrical wire explosion technique.                                                                                                                   |                                                                  |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                   | <b>STRUCTURAL CHARACTERISTICS</b>                                | <b>9 Periods</b> |
| Principles of emerging nanoscale X-ray techniques such as small angle X-ray scattering and X-ray absorption fine structure (XAFS), electron and neutron diffraction techniques and their application to nanomaterials; SPM, Nanoindentation, Grain size, phase formation, texture, stress analysis |                                                                  |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                    | <b>APPLICATIONS</b>                                              | <b>9 Periods</b> |
| Applications of nanoparticles, quantum dots, nanotubes, nanowires, nanocoatings; applications in electronic, electrical and medical industries                                                                                                                                                     |                                                                  |                  |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Bhusan, Bharat (Ed), "Springer Handbook of Nanotechnology", 2nd edition, 2007.<br>2. Carl C. Koch (ed.), NANOSTRUCTURED MATERIALS, Processing, Properties and Potential Applications, NOYES PUBLICATIONS, Norwich, New York, U.S.A.                                                                                                                                                                                                              |
| <b>Reference Books:</b>    | 1. Poole C.P, and Owens F.J., Introduction to Nanotechnology, John Wiley 2003<br>2. Nalwa H.S., Encyclopedia of Nanoscience and Nanotechnology, American Scientific Publishers 2004<br>3. Zehetbauer M.J. and Zhu Y.T., Bulk Nanostructured Materials, Wiley 2008<br>4. Wang Z.L., Characterization of Nanophase Materials, Wiley 2000<br>5. Gutkin Y., Ovid'ko I.A. and Gutkin M., Plastic Deformation in Nanocrystalline Materials, Springer 2004 |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.tutorialsduniya.com/">https://www.tutorialsduniya.com/</a>                                                                                                                                                                                                                                                                                                                                                                     |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Evaluate nanomaterials and understand the different types of nanomaterials                | Understand (K2)      |
| <b>CO2</b>                                                | Recognize the effects of dimensionality of materials on the properties                    | Apply (K3)           |
| <b>CO3</b>                                                | Process different nanomaterials and use them in engineering applications                  | Apply (K3)           |
| <b>CO4</b>                                                | Use appropriate techniques for characterising nanomaterials                               | Apply (K3)           |
| <b>CO5</b>                                                | Identify and use different nanomaterials for applications in different engineering fields | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 2   | 3   | 2   | 3   | 3   | -   | -   | 1   | 1   | 3    | 1    | 1    | -    | -    | -    |
| <b>CO2</b>  | 2   | 3   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO3</b>  | 2   | 2   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO4</b>  | 2   | 2   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO5</b>  | 2   | 2   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401



## I - Course Name: 23OME12 - Nano Technology

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                           |
|---|-----------------------------------------------------------------------------------------------------------|
| 1 | To understand the basic concepts and principles of nanoscience and nanotechnology.                        |
| 2 | To study the synthesis methods and characterization techniques of nanomaterials.                          |
| 3 | To explore the mechanical, electrical, magnetic, and optical properties of nanomaterials.                 |
| 4 | To familiarize students with the applications of nanomaterials in engineering, medicine, and electronics. |
| 5 | To develop awareness of the environmental, health, and safety aspects of nanotechnology.                  |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                          | INTRODUCTION                                    | 8 Periods  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------|
| General definition and size effects—important nano structured materials and nano particles- importance of nano materials- Size effect on thermal, electrical, electronic, mechanical, optical and magnetic properties of nanomaterials- surface area - band gap energy and applications. Photochemistry and Electrochemistry of nanomaterials –Ionic properties of nanomaterials- Nano catalysis. |                                                 |            |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                         | SYNTHESIS OF NANOMATERIALS                      | 8 Periods  |
| Bottom up and Top-down approach for obtaining nano materials - Precipitation methods – sol gel technique – high energy ball milling, CVD and PVD methods, gas phase condensation, magnetron sputtering and laser deposition methods – laser ablation, sputtering.- Laser-Assisted Synthesis of Nanomaterials- Magnetron Sputtering for Thin Film Nanocoatings.                                    |                                                 |            |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                        | NANO COMPOSITES                                 | 10 Periods |
| Definition- importance of nanocomposites- nano composite materials-classification of composites- metal/metal oxides, metal-polymer- thermoplastic based, thermoset based and elastomer based- influence of size, shape and role of interface in composites applications..- Graphene-Based Polymer Nanocomposites.                                                                                 |                                                 |            |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                         | NANO STRUCTURES AND CHARACTERIZATION TECHNIQUES | 10 Periods |
| Classifications of nanomaterials - Zero dimensional, one-dimensional and two-dimensional nanostructures- Kinetics in nanostructured materials- multilayer thin films and superlattice- clusters of metals, semiconductors and nanocomposites. Spectroscopic techniques, Diffraction methods, thermal analysis method, BET analysis method.- X-ray Photoelectron Spectroscopy.                     |                                                 |            |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                          | APPLICATIONS OF NANO MATERIALS                  | 9 Periods  |
| Overview of nanomaterials properties and their applications, nano painting, nano coating, nanomaterials for renewable energy, Molecular Electronics and Nanoelectronics – Nanobots- Biological Applications. Emerging technologies for environmental applications- Practice of nanoparticles for environmental remediation and water treatment-Nanotechnology in Environmental Remediation.       |                                                 |            |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmom, Burkhard Raguse, " Nano Technology: Basic Science & Engineering Technology", 2005, Overseas Press<br>2. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications" Imperial College Press, 2004<br>3. William A Goddard "Handbook of Nanoscience, Engineering and Technology", 3rd Edition, CRC Taylor and Francis group 2012. |
| <b>Reference Books:</b>    | 1. R.H.J. Hannink & A.J. Hill, Nanostructure Control, Wood Head Publishing Ltd., Cambridge, 2006.<br>2. C.N.R. Rao, A. Muller, A.K. Cheetham, The Chemistry of Nanomaterials: Synthesis, Properties and Applications Vol. I & II, 2nd edition, 2005, Wiley VCH Verlag Gbtl & Co<br>3. Ivor Brodie and Julius J. Muray, 'The physics of Micro/Nano – Fabrication', Springer International Edition, 2010              |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/113106093">nptel.ac.in/courses/113106093</a>                                                                                                                                                                                                                                                                                                                                   |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                            | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand the basic properties such as structural, physical, chemical properties of nanomaterials and their applications. | Understand (K2)      |
| CO2                                                       | Able to acquire knowledge about the different types of nano material.                                                      | Apply (K3)           |
| CO3                                                       | Describes about the shape, size, structure of composite nano materials and their interference.                             | Understand (K2)      |
| CO4                                                       | Understand the different characterization techniques for nanomaterials.                                                    | Understand (K2)      |
| CO5                                                       | Develop a deeper knowledge in the application of nanomaterials in different fields.                                        | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 2   | 3   | 2   | 3   | 3   | -   | -   | 1   | 1   | 3    | 1    | 1    | -    | -    | -    |
| CO2         | 2   | 3   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| CO3         | 2   | 2   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| CO4         | 2   | 2   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| CO5         | 2   | 2   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**I - Course Name: 23OME13 - OPERATION MANAGEMENT**

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                                         |
|---|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Recognize and appreciate the concept of Production and Operations Management in creating and enhancing a firm's competitive advantages. |
| 2 | Describe the concept and contribution of various constituents of Production and Operations Management (both manufacturing and service). |
| 3 | Relate the interdependence of the operations function with the other key functional areas of a firm.                                    |
| 4 | Teach analytical skills and problem-solving tools to the analysis of the operations problems.                                           |
| 5 | Apply scheduling and Lean Concepts for improving System Performance.                                                                    |

**III - Course Content**

|                                                                                                                                                                                                                                                                                                                                                                                            |                                                    |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                                                                                            | <b>INTRODUCTION TO OPERATIONS MANAGEMENT</b>       | <b>9 Periods</b> |
| Operations Management – Nature, Importance, historical development, transformation processes, differences between services and goods, a system perspective, functions, challenges, current priorities, recent trends; Operations Strategy - Strategic fit , framework; Supply Chain Management                                                                                             |                                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>FORECASTING, CAPACITY AND FACILITY DESIGN</b>   | <b>9 Periods</b> |
| Demand Forecasting - Need, Types, and steps. Overview of Qualitative and Quantitative methods. Capacity Planning - Long range, Types, Developing capacity alternatives. Overview of sales and operations planning. Overview of MRP, MRP II and ERP. Facility Location – Theories, Steps in Selection, Location Models. Facility Layout – Principles, Types, Planning tools and techniques. |                                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                                                                                                          | <b>DESIGN OF PRODUCT, PROCESS AND WORK SYSTEMS</b> | <b>9 Periods</b> |
| Product Design – Influencing factors, Approaches, Legal, Ethical and Environmental issues. Process – Planning, Selection, Strategy, Major Decisions. Work Study, Procedure. Method Study and Motion Study. Work Measurement and Productivity – Measuring Productivity and Methods to improve productivity.                                                                                 |                                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>MATERIALS MANAGEMENT</b>                        | <b>9 Periods</b> |
| Materials Management – Planning, Budgeting and Control. Purchasing, Functions, Policies, Vendor rating and Value Analysis. Stores Management – Nature, Layout, Classification and Coding. Inventory, Costs and control techniques. Overview of JIT.                                                                                                                                        |                                                    |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                                                                                            | <b>SCHEDULING AND PROJECT MANAGEMENT</b>           | <b>9 Periods</b> |
| Project Management – Scheduling Techniques, PERT, CPM; Scheduling - work centers – nature, importance; Priority rules and techniques, shopfloor control; Flow shop scheduling – Johnson's Algorithm – Gantt charts; personnel scheduling in services.                                                                                                                                      |                                                    |                  |

**Total: 45 Periods**

|                    |                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b> | 1. Richard B. Chase, Ravi Shankar, F. Robert Jacobs, Nicholas J. Aquilano, Operations and Supply Management, Tata McGraw Hill, 12th Edition, 2010.<br>2. Norman Gaither and Gregory Frazier, Operations Management, South Western Cengage Learning, 2002. |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

  
 Chairperson, Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b>    | 1. William J Stevenson, Operations Management, Tata McGraw Hill, 9th Edition, 2009.<br>2. Russel and Taylor, Operations Management, Wiley, Fifth Edition, 2006.<br>3. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.<br>4. Chary S. N, Production and Operations Management, Tata McGraw Hill, Third Edition, 2008.<br>5. Aswathappa K and Shridhara Bhat K, Production and Operations Management, Himalaya Publishing House, Revised Second Edition, 2008.<br>6. Mahadevan B, Operations Management Theory and practice, Pearson Education, 2007.<br>7. Pannerselvam R, Production and Operations Management, Prentice Hall India, Second Edition, 2008. |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/108102191">nptel.ac.in/courses/108102191</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                                            | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Appreciate the role of Production and Operations management in enabling and enhancing a firm's competitive advantages in the dynamic business environment. | Understand (K2)      |
| <b>CO2</b>                                                | Obtain sufficient knowledge and skills to forecast demand for Production and Service Systems.                                                              | Understand (K2)      |
| <b>CO3</b>                                                | Formulate and Assess Aggregate Planning strategies and Material Requirement Plan.                                                                          | Understand (K2)      |
| <b>CO4</b>                                                | Develop analytical skills to calculate capacity requirements and developing capacity alternatives.                                                         | Apply (K3)           |
| <b>CO5</b>                                                | Apply scheduling and Lean Concepts for improving System Performance                                                                                        | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | 2   | 1   | -   | -   | 1   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 2   | 1   | -   | -   | 1   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 2   | 1   | -   | -   | 1   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 2   | 1   | -   | -   | 1   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO5</b>  | 3   | 3   | 2   | 1   | -   | -   | 1   | -   | -   | -    | -    | 3    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OME14 - Production Planning and Control

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                    |
|---|----------------------------------------------------------------------------------------------------|
| 1 | To understand the concept of production planning and control act work study.                       |
| 2 | To apply the concept of product planning.                                                          |
| 3 | To analyze the production scheduling.                                                              |
| 4 | To apply the Inventory Control concepts.                                                           |
| 5 | To prepare the manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP). |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | OVERVIEW OF PRODUCTION PLANNING CONTROL    | 9 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------|
| Objectives and benefits of planning and control-Functions of production control-Types of production job-batch and continuous-Product development and design-Marketing aspect - Functional aspects Operational aspect-Durability and dependability aspect aesthetic aspect. Profit consideration Standardization, Simplification & specialization- Break even analysis-Economics of a new design. FORECASTING: Importance - Forecasting Techniques- qualitative methods: Jury/Expert Method, Survey method, Sales force composite method, Delphi method and quantitative methods: Simple average, moving average, smoothing coefficient, Least Square method |                                            |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | WORK STUDY                                 | 9 Periods |
| Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study – work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.                                                                                                                                                                                                                                                                                                                               |                                            |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | PRODUCT PLANNING AND PROCESS PLANNING      | 9 Periods |
| Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning- Steps in process planning-Quantity determination in batch production-Machine capacity, balancing- Analysis of process capabilities in a multi product system.                                                                                                                                                                                                                                                                                           |                                            |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | PRODUCTION SCHEDULING                      | 9 Periods |
| Production Control Systems-Loading and scheduling-Master Scheduling- Scheduling Policies-Scheduling rules-Gantt charts-Perpetual loading-Basic scheduling problems - Line of balance – Flow production scheduling. Batch production scheduling-Product sequencing – Production Control systems- Periodic batch control. Material requirement planning kanban – Dispatching-Progress reporting and expediting-Manufacturing lead time-Techniques for aligning completion times and due dates.                                                                                                                                                                |                                            |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | INVENTORY CONTROL AND RECENT TRENDS IN PPC | 9 Periods |
| Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system - Ordering cycle system-Determination of Economic order quantity and economic lot size. ABC analysis - Recorder procedure-Introduction to computer integrated production planning systems elements of JUST IN TIME SYSTEMS-Fundamentals of MRP II and ERP.                                                                                                                                                                                                                                                                                   |                                            |           |

Total: 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Chary. S.N., "Theory and Problems in Production & Operations Management", Tata McGraw Hill, 1995.<br>2. Elwood S.Buffa, and Rakesh K.Sarin, "Modern Production / Operations Management", 8th Edition John Wiley and Sons, 2000<br>3. Jain. K.C. & Aggarwal. L.N., "Production Planning Control and Industrial Management", Khanna Publishers, 1990<br>4. Kanishka Bedi, "Production and Operations management", 2nd Edition, Oxford university press, 2007. |
| <b>Reference Books:</b>    | 1. Jain, Jain, "Production planning and control", Khanna Publications, 1st Edition, 2012..<br>2. Power Plant Engineering Author: P.K. Nag Edition: 4th Edition Publisher: McGraw Hill Education Year: 2014<br>3. A Textbook of Power Plant Engineering Author: R.K. Rajput Edition: Latest Edition Publisher: Laxmi Publications Year: 2007                                                                                                                    |
| <b>MOOC/Web Platforms:</b> | <a href="https:// nptel/courses/video/112105126/L01.html">https:// nptel/courses/video/112105126/L01.html</a>                                                                                                                                                                                                                                                                                                                                                  |

## IV – Course Outcomes

| On completion of the course, the students will be able to |                                                                                          | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand production planning and control act work study.                               | Understand (K2)      |
| CO2                                                       | Apply product planning.                                                                  | Apply (K3)           |
| CO3                                                       | Apply production scheduling.                                                             | Apply (K3)           |
| CO4                                                       | Use Inventory Control.                                                                   | Apply (K3)           |
| CO5                                                       | Plan Manufacturing Requirement Planning (MRP II) and Enterprise Resource Planning (ERP). | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| CO2         | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| CO3         | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| CO4         | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| CO5         | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OME15 - Quality Engineering

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                  |
|---|------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce fundamental concepts, dimensions, and economics of quality engineering.                             |
| 2 | To impart knowledge on statistical process control using control charts for variables and attributes.            |
| 3 | To develop analytical skills in advanced control tools and factorial experimental design.                        |
| 4 | To evaluate process stability, process capability, and measurement system capability.                            |
| 5 | To apply acceptance sampling methods, Taguchi techniques, and robust quality design for industrial applications. |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                |                                    |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                                                                                                                | <b>INTRODUCTION</b>                | <b>9 Periods</b> |
| Quality Dimensions–Quality definitions–Inspection–Quality control–Quality Assurance–Quality Planning–Quality costs–Economics of quality– Quality loss function.                                                                                                                                                |                                    |                  |
| <b>Unit – II</b>                                                                                                                                                                                                                                                                                               | <b>CONTROL CHARTS</b>              | <b>9 Periods</b> |
| Chance and assignable causes of process variation, statistical basis of the control chart, control charts for variables- X, R and S charts, attribute control charts - p, np, c and u- Construction and application.                                                                                           |                                    |                  |
| <b>Unit – III</b>                                                                                                                                                                                                                                                                                              | <b>SPECIAL CONTROL</b>             | <b>9 Periods</b> |
| Warning and modified control limits, control chart for individual measurements, multi-vari chart, chart for moving averages and ranges, cumulative-sum and exponentially weighted moving average control charts. Design and analysis of $2^k$ factorial experiments.                                           |                                    |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                                                                                                               | <b>STATISTICAL PROCESS CONTROL</b> | <b>9 Periods</b> |
| Process stability, process capability analysis using a Histogram or probability plots and control chart. Gauge capability studies, setting specification limits, Analysis of variance (ANOVA): One-way and Two-way.                                                                                            |                                    |                  |
| <b>Unit – V</b>                                                                                                                                                                                                                                                                                                | <b>ACCEPTANCE SAMPLING</b>         | <b>9 Periods</b> |
| The acceptance sampling fundamental, OC curve, sampling plans for attributes, simple, double, multiple and sequential, sampling plans for variables, MIL-STD- 05D and MIL-STD-414E & IS2500 standards. Taguchi loss function, orthogonal arrays, and signal-to-noise ratio analysis for robust quality design. |                                    |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods

|                            |                                                                                                                                                                                                                                                                    |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. D.C. Montgomery, Design and Analysis of Experiments, John Wiley & Sons , Eighth Edition<br>2. M.S.Phadke, Quality Engineering Using Robust Design, Prentice Hall , First Edition                                                                                |
| <b>Reference Books:</b>    | 1. S S. Singh, Total Quality Control Essentials, McGraw Hill , First Edition<br>2. L.S. Srinath, Reliability Engineering, EWP , First Edition                                                                                                                      |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.mooc-list.com/course/quality-engineering-management-edx/">https://www.mooc-list.com/course/quality-engineering-management-edx/</a><br><a href="https://onlinecourses.nptel.ac.in/noc21_mg24">https://onlinecourses.nptel.ac.in/noc21_mg24</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                  | Bloom's Level Mapped |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Control the quality of processes using control charts for variables in manufacturing industries. | Understand (K2)      |
| <b>CO2</b>                                                | Control the occurrence of defective product and the defects in manufacturing companies.          | Apply (K3)           |
| <b>CO3</b>                                                | Control the occurrence of defects in services.                                                   | Apply (K3)           |
| <b>CO4</b>                                                | Analysing and understanding the process capability study.                                        | Analyze (K4)         |
| <b>CO5</b>                                                | Developing the acceptance sampling procedures for incoming raw material.                         | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 2   | -   | -   | -   | -   | -   | 1   | -   | 2    | -    | 1    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 2   | 2   | -   | -   | -   | -   | 2   | -    | -    | 1    | -    | -    | -    |
| <b>CO3</b>  | 2   | 3   | 2   | 2   | 2   | 2   | -   | -   | 3   | 2    | 1    | 2    | -    | -    | -    |
| <b>CO4</b>  | 2   | 3   | 2   | 2   | 2   | 3   | -   | -   | 2   | 1    | 2    | 2    | -    | -    | -    |
| <b>CO5</b>  | 2   | 3   | 3   | 2   | 3   | 2   | 2   | -   | 2   | 1    | 3    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



**I - Course Name: 23OME16 - Sustainable Manufacturing**

| Prerequisite | Program Name                               | Sem      | Category | L | T | P | C |
|--------------|--------------------------------------------|----------|----------|---|---|---|---|
| Nil          | All programs except Mechanical Engineering | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

**II - Course Objectives**

|   |                                                                                                                       |
|---|-----------------------------------------------------------------------------------------------------------------------|
| 1 | Explain the principles of sustainability and their relevance to modern manufacturing.                                 |
| 2 | Evaluate manufacturing processes for energy efficiency, material usage, and waste generation.                         |
| 3 | Integrate recycling, reuse, and remanufacturing principles into production systems.                                   |
| 4 | Incorporate concepts such as lean manufacturing, circular economy, and green supply chain management.                 |
| 5 | Assess emerging technologies such as Industry 4.0, renewable energy integration, and digital twins for sustainability |

**III - Course Content**

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ECONOMIC SUSTAINABILITY                 | 9 Periods |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------|
| Industrial Revolution-Economic sustainability: globalization and international issues Sustainability status - Emerging issues- Innovative products- Reconfiguration manufacturing enterprises - Competitive manufacturing strategies - Performance evaluation- Management for sustainability - Assessments of economic sustainability                                                                                                                                                                                                             |                                         |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SOCIAL AND ENVIRONMENTAL SUSTAINABILITY | 9 Periods |
| Social sustainability – Introduction-Work management -Human rights - Societal commitment -Customers - Business practices -Modelling and assessing social sustainability. Environmental issues pertaining to the manufacturing sector: Pollution - Use of resources -Pressure to reduce costs -Environmental management: Processes that minimize negative environmental impacts -environmental legislation and energy costs - need to reduce the carbon footprint of manufacturing Operations-Modelling and assessing environmental sustainability |                                         |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | SUSTAINABILITY PRACTICES                | 9 Periods |
| Sustainability awareness - Measuring Industry Awareness-Drivers and barriers -Availability of sustainability indicators -Analysis of sustainability practicing -Modeling and assessment of sustainable practicing - Sustainability awareness -Sustainability drivers and barriers - Availability of sustainability indicators-Designing questionnaires- Optimizing Sustainability Indexes-Elements – Cost and time model.                                                                                                                         |                                         |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | TRENDS IN SUSTAINABLE OPERATIONS        | 9 Periods |
| Concepts of competitive strategy and manufacturing strategies and development of a strategic improvement programme - Manufacturing strategy in business success strategy formation and formulation - Structured strategy formulation - Sustainable manufacturing system design options - Approaches to strategy formulation - Realization of new strategies/system designs.                                                                                                                                                                       |                                         |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TRENDS IN SUSTAINABLE OPERATIONS        | 9 Periods |
| Principles of sustainable operations - Life cycle assessment manufacturing and service activities - influence of product design on operations - Process analysis – Capacity management - Quality management - Inventory management - Just-In-Time systems - Resource efficient design - Consumerism and sustainable well-being.                                                                                                                                                                                                                   |                                         |           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

**Total: 45 Periods**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Ibrahim Garbie, "Sustainability in Manufacturing Enterprises Concepts, Analyses and Assessments for Industry 4.0", Springer International Publishing., United States, 2016, ISBN-13: 978-3319293042.<br>2. Davim J.P., "Sustainable Manufacturing", John Wiley & Sons., United States, 2010, ISBN: 978-1-848-21212-1.                                                                                                                                                                                                                        |
| <b>Reference Books:</b>    | 1. Anil Markandya, Climate Change and Sustainable Development: Prospects for Developing Countries, Routledge, 2002<br>2. Systems Analysis for Sustainable Engineering: Theory and Applications, Ni bin Chang, McGraw Hill, Chicago, 2011.<br>3. S.S Purohit, Green Technology-An approach for sustainable Environment, Agrobio publication, India, 2008.<br>4. Meadows, D. Randers, J., Meadows. D. (2004) Limits to growths. The 30-year update. Chelsea Green Publishing. • Meadows, D. (2008) Thinking in systems. Chelsea Green Publishing. |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel/courses/video/112105126/L01.html">https:// nptel/courses/video/112105126/L01.html</a>                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                    | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Discuss the importance of economic sustainability.                                 | Understand (K2)      |
| <b>CO2</b>                                                | The importance of sustainable practices.                                           | Apply (K3)           |
| <b>CO3</b>                                                | Identify drivers and barriers for the given conditions.                            | Apply (K3)           |
| <b>CO4</b>                                                | Formulate strategy in sustainable manufacturing.                                   | Apply (K3)           |
| <b>CO5</b>                                                | Plan for sustainable operation of industry with environmental, cost consciousness. | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO2</b>  | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO3</b>  | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO4</b>  | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |
| <b>CO5</b>  | 3   | 1   | 1   | -   | -   | 2   | 1   | 1   | 1   | -    | 1    | 1    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OMA01 - Algebra and Number Theory

| Prerequisite | Program Name              | Sem      | Category | L | T | P | C |
|--------------|---------------------------|----------|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                              |
|---|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To introduce the basic notions of groups, rings, fields which will then be used to solve related problems.                                   |
| 2 | To examine the key questions in the Theory of Numbers.                                                                                       |
| 3 | To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject. |
| 4 | To introduce the basic notions of congruences.                                                                                               |
| 5 | To apply the concepts in the real time problems by using theorems.                                                                           |

## III - Course Content

| UNIT I                                                                                                                                                                                                                                          | GROUPS AND RINGS                                 | 9 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------|
| Groups: Definition - Properties (Statements only) - Homomorphism - Isomorphism - Cyclic groups (Statements only) - Cosets - Lagrange's theorem. Rings: Definition - Sub rings - Ring homomorphism - Integral domain - Field - Integer modulo n. |                                                  |           |
| UNIT II                                                                                                                                                                                                                                         | FINITE FIELDS AND POLYNOMIALS                    | 9 Periods |
| Rings - Polynomial rings - Irreducible polynomials over finite fields - Factorization of polynomials over finite fields.                                                                                                                        |                                                  |           |
| UNIT III                                                                                                                                                                                                                                        | DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS | 9 Periods |
| Division algorithm - Base-b representations - Number patterns - Prime and composite numbers - GCD - Euclidean algorithm - Fundamental theorem of arithmetic - LCM.                                                                              |                                                  |           |
| UNIT IV                                                                                                                                                                                                                                         | DIOPHANTINE EQUATIONS AND CONGRUENCES            | 9 Periods |
| Linear Diophantine equations - Congruence's - Linear Congruence's - Applications: Divisibility tests - Modular exponentiation - Chinese remainder theorem - 2x2 linear systems.                                                                 |                                                  |           |
| UNIT V                                                                                                                                                                                                                                          | CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS  | 9 Periods |
| Linear Diophantine equations - Congruence's - Linear Congruence's - Applications: Divisibility tests - Modular exponentiation - Chinese remainder theorem - 2x2 linear systems.                                                                 |                                                  |           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Grimaldi, R.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, New Delhi, 2007.<br>2. Thomas Koshy, "Elementary Number Theory with Applications", Elsevier Publications, New Delhi, 2002.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Reference Books:</b>    | 1. P. Sivaramakrishna das and C. Vijayalakshmi, "Algebra and Number Theory", Pearson Publications, 2019.<br>2. Niven. I, Zuckerman's., and Montgomery, H.L., "An Introduction to Theory of Numbers", John Wiley and Sons, Singapore, 2004.<br>3. Lidl.R., and Pitz. G, "Applied Abstract Algebra", Springer Verlag, New Delhi, 2nd Edition, 2006.                                                                                                                                                                                                                                                                                                                                                     |
| <b>MOOC/Web Platforms:</b> | <a href="http://kcl.digimat.in/nptel/courses/video/111108609/L01.html">http://kcl.digimat.in/nptel/courses/video/111108609/L01.html</a><br><a href="https://archive.nptel.ac.in/courses/111/106/111106137/">https://archive.nptel.ac.in/courses/111/106/111106137/</a><br><a href="https://nptel.ac.in/courses/111108413">https://nptel.ac.in/courses/111108413</a><br><a href="https://www.youtube.com/watch?v=B1AMosLhHGU">https://www.youtube.com/watch?v=B1AMosLhHGU</a><br><a href="https://www.slideshare.net/slideshow/number-theory-lesson-1-introduction-to-number-theory/232368762">https://www.slideshare.net/slideshow/number-theory-lesson-1-introduction-to-number-theory/232368762</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                 | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts. | Apply (K3)           |
| CO2                                                       | Demonstrate accurate and efficient use of advanced algebraic techniques.                                        | Understand (K 2)     |
| CO3                                                       | Demonstrate their mastery by solving non-trivial problems related to the concepts.                              | Understand (K2)      |
| CO4                                                       | Understand the concepts of congruences and their applications.                                                  | Understand (K2)      |
| CO5                                                       | Apply the classical Theorems to the real time problems.                                                         | Apply (K3)           |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 2   | 2   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO2         | 2   | 2   | 2   | 2   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO3         | 3   | 2   | 2   | 2   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO4         | 2   | 2   | 2   | 2   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO5         | 2   | 2   | 2   | 2   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OMA02 - Graph Theory

| Prerequisite | Program Name              | Sem      | Category | L | T | P | C |
|--------------|---------------------------|----------|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                              |
|---|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Impart mathematical modelling to describe and explore real-world phenomena and data.                                                         |
| 2 | Provide basic understanding on Linear, quadratic, power and polynomial, exponential, and multi variable models.                              |
| 3 | Summarize and apply the methodologies involved in framing the real world problems related to fundamental principles of polynomial equations. |

## III - Course Content

|                                                                                                                                                                                                                                                                                                                                                     |                                        |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------|
| Unit – I                                                                                                                                                                                                                                                                                                                                            | INTRODUCTION                           | 9 Periods |
| Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits – Connectedness – Components – Euler graphs – Hamiltonian paths and circuits – Trees – Properties of trees – Distance and centers in tree – Rooted and binary trees.                                                                                                      |                                        |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                           | TREES, CONNECTIVITY & PLANARITY        | 9 Periods |
| Spanning trees – Fundamental circuits – Spanning trees in a weighted graph – cut sets – Properties of cut set – All cut sets – Fundamental circuits and cut sets – Connectivity and separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and geometric graphs – Planer graphs – Different representation of a planer graph. |                                        |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                          | MATRICES, COLOURING AND DIRECTED GRAPH | 9 Periods |
| Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem – Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler graphs.                                                                                                         |                                        |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                           | PERMUTATIONS & COMBINATIONS            | 9 Periods |
| Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.                                                                                                         |                                        |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                            | GENERATING FUNCTIONS                   | 9 Periods |
| Generating functions - Partitions of integers - Exponential generating function – Summation operator - Recurrence relations - First order and second order – Non-homogeneous recurrence relations - Method of generating functions.                                                                                                                 |                                        |           |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Narsingh Deo, "Graph Theory: With Application to Engineering and Computer Science", Prentice Hall of India, 2003.<br>2. Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley, 1994.<br>3. Clark. J and Holton D.A "A First look at Graph Theory". Allied Publishers, 1995<br>4. Rosen K.H. "Discrete Mathematics and Its Applications", Mc. Graw Hill, 2007.                                                                                                                                                                                                                                  |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.youtube.com/watch?v=f1JTtMP6NGw">https://www.youtube.com/watch?v=f1JTtMP6NGw</a><br><a href="https://www.youtube.com/watch?v=fZqfKJ-cb28">https://www.youtube.com/watch?v=fZqfKJ-cb28</a><br><a href="https://www.youtube.com/results?search_query=MATRICES%2C+COLOURING+AND+DIRECTED+GRAPH+NPTEL+">https://www.youtube.com/results?search_query=MATRICES%2C+COLOURING+AND+DIRECTED+GRAPH+NPTEL+</a><br><a href="https://www.youtube.com/watch?v=Dsi7x-A89Mw">https://www.youtube.com/watch?v=Dsi7x-A89Mw</a><br><a href="https://www.youtube.com/watch?v=QylihXAZzD8">https://www.youtube.com/watch?v=QylihXAZzD8</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                                         | Bloom's Level Mapped |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Write precise and accurate mathematical definitions of objects in graph theory.                                                         | Understand (K2)      |
| <b>CO2</b>                                                | Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples                           | Apply (K3)           |
| <b>CO3</b>                                                | Validate and critically assess a mathematical proof.                                                                                    | Apply (K3)           |
| <b>CO4</b>                                                | Use a combination of theoretical knowledge and independent mathematics thinking in creative investigation of questions in graph theory. | Apply (K3)           |
| <b>CO5</b>                                                | Reason from definitions to construct mathematical proofs.                                                                               | Analyse (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | 3    | -    | -    | -    |
| <b>CO5</b>  | 3   | 3   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | 3    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OMA03 - LINEAR ALGEBRA

| Prerequisite | Program Name              | Sem      | Category | L | T | P | C |
|--------------|---------------------------|----------|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                             |
|---|---------------------------------------------------------------------------------------------|
| 1 | To test the consistency and solve system of linear equations.                               |
| 2 | To find the basis and dimension of vector space.                                            |
| 3 | To obtain the matrix of linear transformation and its eigenvalues and eigenvectors.         |
| 4 | To find orthonormal basis of inner product space and find least square approximation.       |
| 5 | To find eigenvalues of a matrix using numerical techniques and perform matrix decomposition |

## III - Course Content

|                                                                                                                                                                                                                    |                                                      |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                                                                    | <b>MATRICES AND SYSTEM OF LINEAR EQUATIONS</b>       | <b>9 Periods</b> |
| Matrices - Row echelon form - Rank - System of linear equations - Consistency - Gauss elimination method - Gauss Jordan method.                                                                                    |                                                      |                  |
| <b>Unit – II</b>                                                                                                                                                                                                   | <b>VECTOR SPACES</b>                                 | <b>9 Periods</b> |
| Vector spaces over Real and Complex fields - Subspace – Linear space – Linear independence and dependence - Basis and dimension.                                                                                   |                                                      |                  |
| <b>Unit – III</b>                                                                                                                                                                                                  | <b>LINEAR TRANSFORMATION</b>                         | <b>9 Periods</b> |
| Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem – Matrix representation of linear transformation - Eigenvalues and eigenvectors of linear transformation diagonalization. |                                                      |                  |
| <b>Unit – IV</b>                                                                                                                                                                                                   | <b>INNER PRODUCT SPACES</b>                          | <b>9 Periods</b> |
| Inner product and norms - Properties - Orthogonal, Orthonormal vectors - Gram Schmidt orthonormalization process - Least square approximation.                                                                     |                                                      |                  |
| <b>Unit – V</b>                                                                                                                                                                                                    | <b>EIGEN VALUE PROBLEMS AND MATRIX DECOMPOSITION</b> | <b>9 Periods</b> |
| Eigen value Problems: Power method, Jacobi rotation method - Singular value decomposition – QR decomposition.                                                                                                      |                                                      |                  |

Total: 45 Periods

  
 Chairperson Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Faires J.D. and Burden R., Numerical Methods, Brooks/Cole (Thomson Publications), New Delhi, 2002.<br>2. Friedberg A.H, Insel A.J. and Spence L, Linear Algebra, Pearson Education, 5th Edition, 2019.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Reference Books:</b>    | 1. Bernard Kolman, David R. Hill, Introductory Linear Algebra, Pearson Educations, New Delhi, 8th Edition, 2009.<br>2. Gerald C.F. and Wheatley P.O, Applied Numerical Analysis, Pearson Educations, New Delhi, 7th Edition, 2007.<br>3. Kumaresan S, Linear Algebra - A geometric approach, Prentice Hall of India, New Delhi, Reprint, 2010.<br>4. Richard Branson, Matrix Operations, Schaum's outline series, 1989.<br>5. Strang G, Linear Algebra and its applications, Thomson (Brooks / Cole) New Delhi, 4th Edition, 2005.<br>6. Sundarapandian V, Numerical Linear Algebra, Prentice Hall of India, New Delhi, 2014. |
| <b>MOOC/Web Platforms:</b> | <a href="https://nptel.ac.in/courses/111106135">https://nptel.ac.in/courses/111106135</a><br><a href="https://nptel.ac.in/courses/111102011">https://nptel.ac.in/courses/111102011</a><br><a href="https://www.youtube.com/watch?v=ZLh4Ud_vjB8">https://www.youtube.com/watch?v=ZLh4Ud_vjB8</a>                                                                                                                                                                                                                                                                                                                               |

**IV - Course Outcomes**

| On completion of the course, the students will be able to |                                                                                           | Bloom's Level Mapped |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Test the consistency and solve system of linear equations.                                | Understand (K2)      |
| <b>CO2</b>                                                | Find the basis and dimension of vector space.                                             | Apply (K3)           |
| <b>CO3</b>                                                | Obtain the matrix of linear transformation and its eigenvalues and eigenvectors.          | Apply (K3)           |
| <b>CO4</b>                                                | Find orthonormal basis of inner product space and find least square approximation.        | Apply (K3)           |
| <b>CO5</b>                                                | Find eigenvalues of a matrix using numerical techniques and perform matrix decomposition. | Apply (K3)           |

**V - Mapping Table Mapping of COs with POs and PSOs**

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | 3   | 3   | 3   | 3   | 2   | 2   | 2   | 1   | 1   | 1    | 1    | 3    | -    | -    | -    |
| <b>CO2</b>  | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 1   | 1   | 1    | 1    | 3    | -    | -    | -    |
| <b>CO3</b>  | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 1   | 1   | 1    | 1    | 3    | -    | -    | -    |
| <b>CO4</b>  | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 1   | 1   | 1    | 1    | 3    | -    | -    | -    |
| <b>CO5</b>  | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 1   | 1   | 1    | 1    | 3    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401



## I - Course Name: 23OMA04 - OPERATIONS RESEARCH

| Prerequisite | Program Name              | Sem      | Category | L | T | P | C |
|--------------|---------------------------|----------|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                                     |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To provide the concept and an understanding of basic concepts in Operations Research techniques for Analysis and Modeling in Computer Applications. |
| 2 | To understand, develop and solve mathematical model of linear programming problems.                                                                 |
| 3 | To understand, develop and solve mathematical model of Transport and assignment problems.                                                           |
| 4 | To Understand network modeling for planning and scheduling the project activities.                                                                  |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                         | LINEAR PROGRAMMING MODELS            | 9 Periods |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------|
| Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables: big-M -Two Phase method, degeneracy and unbound solutions.                                                                                                                                                  |                                      |           |
| Unit – II                                                                                                                                                                                                                                                                                        | TRANSPORTATION AND ASSIGNMENT MODELS | 9 Periods |
| Formulation - Methods for finding basic Feasible Solution - Optimality Test - MODI method - Degeneracy in Transportation Problem -Unbalanced Transportation Problem. Assignment Method: Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem |                                      |           |
| Unit – III                                                                                                                                                                                                                                                                                       | SCHEDULING BY PERT AND CPM           | 9 Periods |
| Introduction - Rules to frame a Network - Fulkerson's Rule to numbering of events - Activity, Times - Critical Path Computation - Slack and Float - PERT- Steps and computing variance, Merits and demerits of PERT, CPM- Time estimating & Limitations, Comparison between PERT & CPM.          |                                      |           |
| Unit – IV                                                                                                                                                                                                                                                                                        | QUEUEING MODELS                      | 9 Periods |
| Characteristics of Queueing Models–Poisson Queues-(M / M/1): (FIFO/∞/∞), (M / M / 1): (FIFO / N / ∞), (M / M / C): (FIFO / ∞ / ∞), (M / M / C): (FIFO / N / ∞) models.                                                                                                                           |                                      |           |
| Unit – V                                                                                                                                                                                                                                                                                         | GAME THEORY                          | 9 Periods |
| Competitive game, rectangular game, saddle point, minimax (maximin) method of optimal strategies- value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games                                          |                                      |           |

Total: 45 Periods

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b>    | 1. Taha H.A., "Operations Research: An Introduction", 10th Edition, Prentice Hall of India, New Delhi, 2017<br>2. Kanti Swarup, P.K. Gupta, Man Mohan, "Operations Research", 15th Revised Edition, S. Chand & Sons Education Publications, New Delhi, 2017<br>3. Ronald L Rardin, Optimization in Operations Research, 2nd Edition, Pearson Education, India, 2018<br>4. Jatinder Kumar, Optimization Techniques in Operations Research, LAP LAMBERT Academic Publishing, 2015<br>5. D.S. Hira and P.K. Gupta, Operations Research, 5th Edition, S. Chand & Sons, 2015.                              |
| <b>MOOC/Web Platforms:</b> | <a href="http://www.digimat.in/nptel/courses/video/111104027/L01.html">www.digimat.in/nptel/courses/video/111104027/L01.html</a><br><a href="https://www.youtube.com/watch?v=Q31jKiEXxdc">https://www.youtube.com/watch?v=Q31jKiEXxdc</a><br><a href="http://www.digimat.in/nptel/courses/video/110104073/L21.html">www.digimat.in/nptel/courses/video/110104073/L21.html</a><br><a href="https://nptel.ac.in/courses/117103017">https://nptel.ac.in/courses/117103017</a><br><a href="https://onlinecourses.nptel.ac.in/noc19_ge32/preview">https://onlinecourses.nptel.ac.in/noc19_ge32/preview</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Understand and apply linear programming to solve operational problem with constraints. | Apply (K3)           |
| CO2                                                       | Apply transportation and assignment models to find optimal solution.                   | Apply (K3)           |
| CO3                                                       | To prepare project scheduling using PERT and CPM.                                      | Apply (K3)           |
| CO4                                                       | Identify and analyze appropriate queuing model to reduce the waiting time in queue.    | Apply (K3)           |
| CO5                                                       | To choose the best strategy using decision making methods under game theory.           | Analyse (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO2         | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO3         | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO4         | 3   | 3   | 2   | 2   | -   | 1   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO5         | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OMA05 - Queueing and Reliability Modelling

| Prerequisite | Program Name              | Sem      | Category | L | T | P | C |
|--------------|---------------------------|----------|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                                                    |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.      |
| 2 | To understand the concept of queueing models and apply in engineering.                                                                                             |
| 3 | To provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering. |
| 4 | To study the system reliability and hazard function for series and parallel systems.                                                                               |
| 5 | To implement Markovian Techniques for availability and maintainability which opens up new avenues for research                                                     |

## III - Course Content

|                                                                                                                                                                              |                                         |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------|
| <b>Unit – I</b>                                                                                                                                                              | <b>RANDOM PROCESSES</b>                 | <b>9 Periods</b> |
| Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.            |                                         |                  |
| <b>Unit – II</b>                                                                                                                                                             | <b>MARKOVIAN QUEUEING MODELS</b>        | <b>9 Periods</b> |
| Markovian queues – Birth and death processes – Single and multiple server queueing models – Little's formula - Queues with finite waiting rooms.                             |                                         |                  |
| <b>Unit – III</b>                                                                                                                                                            | <b>ADVANCED QUEUEING MODELS</b>         | <b>9 Periods</b> |
| M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.                                                        |                                         |                  |
| <b>Unit – IV</b>                                                                                                                                                             | <b>SYSTEM RELIABILITY</b>               | <b>9 Periods</b> |
| Reliability and hazard functions- Exponential, Normal, Weibull and Gamma failure distribution – Time - dependent hazard models – Reliability of Series and Parallel Systems. |                                         |                  |
| <b>Unit – V</b>                                                                                                                                                              | <b>MAINTAINABILITY AND AVAILABILITY</b> | <b>9 Periods</b> |
| Maintainability and Availability functions – Frequency of failures – Two Unit parallel system with repair – k out of m systems.                                              |                                         |                  |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Books:</b>    | 1. Medhi J, "Stochastic models of Queueing Theory", Academic Press, Elsevier, Amsterdam, 2003.<br>2. Taha, H.A., "Operations Research", 9 <sup>th</sup> Edition, Pearson India Education Services, Delhi, 2016.<br>3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2 <sup>nd</sup> Edition, John Wiley and Sons, 2002.<br>4. Govil A.K., "Reliability Engineering", Tata-McGraw Hill Publishing Company Ltd., New Delhi, 1983.                                                                                          |
| <b>MOOC/Web Platforms:</b> | <a href="https://www.classcentral.com/course/youtube-electronics-probability-random-variables-47668">https://www.classcentral.com/course/youtube-electronics-probability-random-variables-47668</a><br><a href="https://onlinecourses.nptel.ac.in/noc21_ee93/preview">https://onlinecourses.nptel.ac.in/noc21_ee93/preview</a><br><a href="https://onlinecourses.nptel.ac.in/noc21_ce58/preview">https://onlinecourses.nptel.ac.in/noc21_ce58/preview</a><br><a href="https://onlinecourses.nptel.ac.in/noc21_ce58/preview">https://onlinecourses.nptel.ac.in/noc21_ce58/preview</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                                                              | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------|
| CO1                                                       | Enable the students to apply the concept of random processes in engineering disciplines.                                     | Apply (K3)           |
| CO2                                                       | Students acquire skills in analyzing various queueing models.                                                                | Apply (K3)           |
| CO3                                                       | Students can understand and characterize phenomenon which evolve with respect to time in a probabilistic manner.             | Apply (K3)           |
| CO4                                                       | Students can analyze reliability of the systems for various probability distributions.                                       | Apply (K3)           |
| CO5                                                       | Students can be able to formulate problems using the maintainability and availability analyses by using theoretical approach | Analyse (K4)         |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | 3   | 3   | -   | -   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO2         | 3   | 3   | 2   | -   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO3         | 3   | 3   | -   | 2   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO4         | 3   | 3   | 2   | -   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |
| CO5         | 3   | 3   | 3   | 2   | -   | -   | -   | -   | 2   | -    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401



## I - Course Name: 23OMA06 - Resource Management Techniques

| Prerequisite | Program Name              | Sem      | Category | L | T | P | C |
|--------------|---------------------------|----------|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                |
|---|--------------------------------------------------------------------------------|
| 1 | To formulate linear programming problems and solve LPP using simple algorithm. |
| 2 | To solve networking problems.                                                  |
| 3 | To formulate and solve integer programming problems.                           |
| 4 | To solve Non-Linear programming problems.                                      |
| 5 | To understand and solve project management problems.                           |

## III - Course Content

|                                                                                                                                                                          |                               |           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------|
| Unit – I                                                                                                                                                                 | LINEAR PROGRAMMING            | 9 Periods |
| Principal components of decision problem – Modeling phases – LP formulation and graphic solution – Resource allocation problems – simplex method – sensitivity analysis. |                               |           |
| Unit – II                                                                                                                                                                | DUALITY AND NETWORKS          | 9 Periods |
| Definition of dual problems – primal – Dual relationships – Dual simplex method –post optimality analysis – Transportation and assignment model – Shortest route problem |                               |           |
| Unit – III                                                                                                                                                               | INTEGER PROGRAMMING           | 9 Periods |
| Cutting plan algorithm – Branch and bound methods, Multistage (Dynamic) programming                                                                                      |                               |           |
| Unit – IV                                                                                                                                                                | CLASSICAL OPTIMIZATION THEORY | 9 Periods |
| Unconstrained external problems, Newton – Raphson method – Equality constraints –Jacobeian methods – Lagrangian method – Kuhn – Tucker conditions – Simple problems      |                               |           |
| Unit – V                                                                                                                                                                 | OBJECT SCHEDULING             | 9 Periods |
| Network diagram representation – Critical path method – Time charts and resource leveling – PERT.                                                                        |                               |           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

Total: 45 Periods

|                            |                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. H.A. Taha, "Operation Research", Prentice Hall of India, 2002.                                                                                                                                                                                                                                                                                                                                            |
| <b>Reference Books:</b>    | 1. Paneer selvam, 'Operations Research' Prentice Hall of India, 2002.<br>2. Anderson 'Quantitative Methods for Business', 8 <sup>th</sup> Edition, Thomson Learning, 2002.<br>3. Winston 'Operations Research for Business', Thomson Learning, 2003.<br>4. Vohra, 'Quantitative Techniques in Management', Tata Mc Graw Hill, 2002.<br>5. Anand sarma, 'Operation Research' Himalaya Publishing House, 2003. |
| <b>MOOC/Web Platforms:</b> | <a href="https://share.google/uasnB9X2KP7TbVhjU">https://share.google/uasnB9X2KP7TbVhjU</a><br><a href="https://share.google/G2pLV43yVjHiPWCQ">https://share.google/G2pLV43yVjHiPWCQ</a><br><a href="https://share.google/0ddZC1NWcqQyv6bds">https://share.google/0ddZC1NWcqQyv6bds</a>                                                                                                                      |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                          | Bloom's Level Mapped |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Understand to formulate linear programming problems and solve LPP using simple algorithm | Understand (K2)      |
| <b>CO2</b>                                                | Understand to solve networking problems                                                  | Understand (K2)      |
| <b>CO3</b>                                                | Understand to formulate and solve integer programming problems                           | Understand (K2)      |
| <b>CO4</b>                                                | Understand to solve Non-Linear programming problems                                      | Understand (K2)      |
| <b>CO5</b>                                                | Understand to solve project management problems                                          | Understand (K2)      |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b>  | -   | 3   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | 2    | 3    |
| <b>CO2</b>  | -   | 3   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | 2    | 3    |
| <b>CO3</b>  | -   | 3   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | 2    | 3    |
| <b>CO4</b>  | -   | 3   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | 2    | 3    |
| <b>CO5</b>  | -   | 3   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | 2    | 3    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401

## I - Course Name: 23OHS01 - English for Competitive Examinations

| Prerequisite | Program Name              | Sem      | Category | L | T | P | C |
|--------------|---------------------------|----------|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                                                                                                                                     |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To train the students in the language components essential to face competitive examinations both at the national (UPSC, Banking, Railway, Defense) and the international level (GRE, TOEFL, IELTS). |
| 2 | To enhance an awareness of the specific patterns in language testing and the respective skills to tackle verbal reasoning and verbal ability tests.                                                 |
| 3 | To inculcate effective practices in language-learning in order to improve accuracy in usage of grammar and coherence in writing.                                                                    |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | VOCABULARY AND VERBAL ABILITY     | 9 Periods |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------|
| Orientation on different formats of competitive exams Vocabulary Verbal ability Verbal reasoning - Exploring the world of words - Essential words - Meaning and their usage - Synonyms-antonyms - Word substitution - Word analogy - Idioms and phrases Commonly confused words - Spellings - Word expansion - new words in use.                                                                                                                                                                                               |                                   |           |
| Unit – II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | GRAMMAR AND SENTENCE CONSTRUCTION | 9 Periods |
| Grammar - Sentence Improvement-Sentence completion - Rearranging phrases into sentences. Error identification-Tenses - Prepositions - Adjectives - Adverbs - Subject-verb agreement - Voice - Reported speech - Articles - Clauses - Speech patterns.                                                                                                                                                                                                                                                                          |                                   |           |
| Unit – III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | READING AND COMPREHENSION SKILLS  | 9 Periods |
| Reading - Specific information and detail - Identifying main and supporting ideas - Speed reading techniques Improving global reading skills Linking ideas Summarizing -Under-standing argument - Identifying opinion/attitude and making inferences - Critical reading.                                                                                                                                                                                                                                                       |                                   |           |
| Unit – IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | WRITING AND COMPOSITION SKILLS    | 9 Periods |
| Writing - Pre-writing techniques - Mind-map - Describing pictures and facts - Paragraph structure organizing points - Rhetoric writing Improving an answer Drafting, writing and developing an argument - Focus on cohesion - Using cohesive devices -Analytic writing - Structure and types of essay Mind maps Structure of drafts, letters, memos, emails Statements of Purpose Structure, Content and Style- Technical writing.                                                                                             |                                   |           |
| Unit – V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | LISTENING AND SPEAKING SKILLS     | 9 Periods |
| Listening and Speaking Contextual listening - Listening to instructions - Listening for specific information Identifying detail, main ideas Following signpost words Stress, rhythm and intonation - Speaking to respond and elicit ideas - Guided speaking - Opening phrases - Interactive communication -Sentence stress - Speaking on a topic - Giving opinions - Giving an oral presentation Telling a story or a personal anecdote - Talking about oneself Utterance Speech acts- Brainstorming ideas - Group discussion. |                                   |           |

Total: 45 Periods

Chairperson  
Department of Information Technology  
NPR College of Engineering & Technology  
(Autonomous),  
Natham, Dindigul 624401

## I - Course Name: 23OHS02 - Project Report Writing

| Prerequisite | Program Name              | Sem      | Category | L | T | P | C |
|--------------|---------------------------|----------|----------|---|---|---|---|
| Nil          | All B.E/B.Tech Programmes | V/VI/VII | OEC      | 3 | 0 | 0 | 3 |

## II - Course Objectives

|   |                                                                                        |
|---|----------------------------------------------------------------------------------------|
| 1 | Understand the essentials of project writing.                                          |
| 2 | Perceive the difference between general writing and technical writing                  |
| 3 | Assimilate the fundamental features of report writing.                                 |
| 4 | Understand the essential differences that exist between general and technical writing. |
| 5 | Learn the structure of a technical and project report                                  |

## III - Course Content

| Unit – I                                                                                                                                                                                                                                                          | Writing Skills                            | 9 Periods |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------|
| Essential Grammar and Vocabulary – Passive Voice, Reported Speech, Concord, Signpost words, Cohesive Devices – Paragraph writing - Technical Writing vs. General Writing.                                                                                         |                                           |           |
| Unit – II                                                                                                                                                                                                                                                         | Project Report                            | 9 Periods |
| Definition, Structure, Types of Reports, Purpose – Intended Audience – Plagiarism– Report Writing in STEM fields – Experiment – Statistical Analysis.                                                                                                             |                                           |           |
| Unit – III                                                                                                                                                                                                                                                        | Structure of the Project Report: (Part 1) | 9 Periods |
| Framing a Title – Content – Acknowledgement – Funding Details -Abstract – Introduction – Aim of the Study – Background - Writing the research question - Need of the Study/Project Significance, Relevance – Determining the feasibility – Theoretical Framework. |                                           |           |
| Unit – IV                                                                                                                                                                                                                                                         | Structure of the Project Report: (Part 2) | 9 Periods |
| Literature Review, Research Design, Methods of Data Collection -Tools and Procedures - Data Analysis - Interpretation - Findings – Limitations - Recommendations – Conclusion – Bibliography                                                                      |                                           |           |
| Unit – V                                                                                                                                                                                                                                                          | Proof reading a report                    | 9 Periods |
| Avoiding Typographical Errors – Bibliography in required Format – Font –Spacing – Checking Tables and Illustrations – Presenting a Report Orally – Techniques                                                                                                     |                                           |           |

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul - 624401

Total: 45 Periods



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>         | 1. Gerson and Gerson-Technical Communication: Process and Product, 7th Edition, Prentice Hall (2012)<br>2. Virendra K. Pamecha - Guide to Project Reports, Project Appraisals and Project Finance (2012)<br>3. Daniel Riordan - Technical Report Writing Today (1998)<br>4. Darla-Jean Weatherford - Technical Writing for Engineering Professionals (2016) Penwell Publishers                                                                                                                                                                                  |
| <b>MOOC/Web Platforms:</b> | <a href="https://devimpactinstitute.com/courses/project-management/training-on-report-writing/">https://devimpactinstitute.com/courses/project-management/training-on-report-writing/</a><br><a href="https://glomacs.com/training-course/advanced-report-writing-and-presentation-skills">https://glomacs.com/training-course/advanced-report-writing-and-presentation-skills</a><br><a href="https://www.indepthresearch.org/course/effective-report-writing-skills-course">https://www.indepthresearch.org/course/effective-report-writing-skills-course</a> |

## IV - Course Outcomes

| On completion of the course, the students will be able to |                                                                                        | Bloom's Level Mapped |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------|
| <b>CO1</b>                                                | Write effective project reports.                                                       | Analyze (K4)         |
| <b>CO2</b>                                                | Use statistical tools with confidence.                                                 | Apply (K3)           |
| <b>CO3</b>                                                | Explain the purpose and intension of the proposed project coherently and with clarity. | Understand (K2)      |
| <b>CO4</b>                                                | Create writing texts to suit achieve the intended purpose.                             | Evaluate (K5)        |
| <b>CO5</b>                                                | Master the art of writing winning proposals and project                                | Evaluate (K5)        |

## V - Mapping Table Mapping of COs with POs and PSOs

| COs/<br>POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |
| CO2         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |
| CO3         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |
| CO4         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |
| CO5         | -   | -   | -   | -   | -   | -   | -   | -   | 2   | 3    | -    | 2    | -    | -    | -    |

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

  
 Chairperson-Board of Studies,  
 Department of Information Technology,  
 NPR College of Engineering & Technology  
 (Autonomous),  
 Natham, Dindigul 624401