# AL-AMEEN ENGINEERING COLLEGE

## (AUTONOMOUS)

**Accredited by NAAC with "A" Grade :: An ISO Certified Institution**
**(Affiliated to Anna University, Chennai & Approved by AICTE, New Delhi)**
**Karundevanpalayam, NanjaiUthukkuli Post, Erode – 638 104, Tamilnadu, INDIA.**

# CURRICULUM

## SEMESTERS – I to VIII

## (Regulations 2023)

## CHOICE BASED CREDIT SYSTEM

## B.E. Computer Science and Engineering

**Applicable to the Students admitted to B.E. / B.Tech. Programmes from the AY 2023-24**

## KNOWLEDGE LEVELS (BLOOM'S TAXONOMY)

| Notation | Knowledge Levels |
|---|---|
| K1 | Remembering |
| K2 | Understanding |
| K3 | Applying |
| K4 | Analysing |
| K5 | Evaluating |
| K6 | Creating |

| INSTITUTION VISION |
|---|
| To be a multi-disciplinary institute of academic excellence in Engineering, Technology and allied fields for uplifting the under-privileged and rural; inculcating brotherhood and positivism among its students. |

| INSTITUTION MISSION |
|---|
| To groom confident, wholesome students with social consciousness and values, by endeavoring experiences for the ever-changing world of work. |

| DEPARTMENT VISION |
|---|
| To be a renowned program for satisfying the rapidly changing information and communication technology needs of the rural and underprivileged with humane values. |

| DEPARTMENT MISSION | |
|---|---|
| M1 | To grow comprehensive ICT experiences in students for uplifting rural and the under-privileged community. |
| M2 | To impart Computer Science education towards inclusiveness of trans-disciplinary areas in the ever-changing ICT environment. |
| M3 | To develop students focused on careers and entrepreneurship with awareness of social, economic and ethical impacts. |

| PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) | |
|---|---|
| **PEO 1** | Graduates will be prepared with an ethical work culture for taking ICT to the rural and the under-privileged. |
| **PEO 2** | Graduates will be employed in the computing profession, and will understand, research, apply new ideas and technologies of ICT as the field evolves. |
| **PEO 3** | Graduates will be equipped with communication skills and leadership qualities, with an interest in, and aptitude for starting-up and growing their own new firms. |
| **PEO 4** | Graduates will demonstrate their ability to work effectively as a team member in an ever-changing professional environment. |

| PROGRAM OUTCOMES (POs) | |
|---|---|
| **PO 1** | **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| **PO 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. |
| **PO 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. |
| **PO 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. |
| **PO 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. |
| **PO 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. |
| **PO 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. |
| **PO 8** | **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **PO 9** | **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| **PO 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. |
| **PO 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. |
| **PO 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 |

| **PROGRAM SPECIFIC OUTCOMES (PSOs)** | |
|---|---|
| **PSO 1** | Organize heterogeneous data for accurate large-scale data processing using appropriate algorithms and tools. |
| **PSO 2** | Understand modern networking technologies and apply programming skills to create scalable real-time applications. |

## CURRICULUM

## SEMESTER I

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | 23MA1T1 | Calculus & Differential Equations | BS | 40 | 60 | 3 | 1 | 0 | 4 |
| **THEORY COURSES WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 2 | 23EN1LT2 | Communicative English | HS | 50 | 50 | 3 | 0 | 2 | 4 |
| 3 | 23PH1LT3 | Engineering Physics | BS | 50 | 50 | 3 | 1 | 2 | 5 |
| 4 | 23CY1LT4 | Engineering Chemistry | BS | 50 | 50 | 3 | 1 | 2 | 5 |
| 5 | 23CS1LT5 | Problem Solving and C Programming | ES | 50 | 50 | 3 | 0 | 4 | 5 |
| **MANDATORY COURSES** | | | | | | | | | |
| 6 | | Universal Human Values 1 – Induction Programme | MC | - | - | - | - | - | - |
| 7 | 23HS1T6 | Heritage of Tamil | MC | 100 | - | 1 | 0 | 0 | 1 |
| **Total** | | | | | | **16** | **3** | **10** | **24** |

## SEMESTER II

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | 23EN2T1 | Technical English | HS | 40 | 60 | 3 | 0 | 0 | 3 |
| 2 | 23HS2T2 | Environmental Sciences | MC | 100 | 0 | 3 | 0 | 0 | 0 |
| 3 | 23HS2T3 | Tamils And Technology | MC | 100 | 0 | 1 | 0 | 0 | 1 |
| 4 | 23MA2T4 | Algebra and Number Theory | BS | 40 | 60 | 3 | 1 | 0 | 4 |
| **THEORY COURSES WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 5 | 23CS2LT1 | Python Programming | ES | 50 | 50 | 3 | 0 | 4 | 5 |
| 6 | 23EE2LT2 | Basics of Electrical and Electronics Engineering | ES | 50 | 50 | 3 | 0 | 4 | 5 |
| **Total** | | | | | | **16** | **1** | **8** | **18** |

## SEMESTER III

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | 23HS3T1 | Constitution of India | MC | 100 | - | 3 | 0 | 0 | 0 |
| 2 | 23MA3T2 | Probability and Queuing Theory | BS | 40 | 60 | 3 | 1 | 0 | 4 |
| 3 | 23CS3T3 | Digital Principles and System Design | ES | 40 | 60 | 3 | 0 | 0 | 3 |
| 4 | 23EC3T4 | User Interface Design | PC | 40 | 60 | 3 | 1 | 0 | 4 |
| **THEORY COURSES WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 5 | 23CS3LT1 | Object Oriented Programming with Java | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| 6 | 23CS3LT2 | Data Structures & Algorithms | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| **LABORATORY COURSES** | | | | | | | | | |
| 7 | 23EN3L1 | Inter Personal Communication Skills Laboratory - I | HS | 60 | 40 | 0 | 0 | 3 | 1.5 |
| **Total** | | | | | | **16** | **2** | **11** | **20.5** |

## SEMESTER IV

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | 23HS4T1 | Universal Human Values 2: Understanding Harmony | HS | 100 | - | 2 | 1 | 0 | 3 |
| 2 | 23CS4T2 | Software Engineering | PC | 40 | 60 | 3 | 0 | 0 | 3 |
| 3 | 23CSCT4 | Computer Organization and Architecture | PC | 40 | 60 | 3 | 0 | 0 | 3 |
| 4 | | Open Elective – I | OE | 40 | 60 | 3 | 0 | 0 | 3 |
| **THEORY COURSE WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 5 | 23CS4LT1 | Database Management Systems | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| 6 | 23CS4LT2 | Operating Systems | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| 7 | 23CS4LT3 | Internet Programming | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| **LABORATORY COURSES** | | | | | | | | | |
| 7 | 23EN4L1 | Inter Personal Communication Skills Laboratory - II | HS | 60 | 40 | 0 | 0 | 3 | 1.5 |
| **Total** | | | | | | **17** | **1** | **15** | **25.5** |

## SEMESTER V

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | | Professional Ethics | HS | 40 | 60 | 3 | 0 | 0 | 3 |
| 2 | | Professional Elective - I | PE | 40 | 60 | 3 | 0 | 0 | 3 |
| 3 | | Open Elective – II | OE | 40 | 60 | 3 | 0 | 0 | 3 |
| **THEORY COURSES WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 4 | | Internet of Things | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| 5 | | Computer Networks | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| 6 | | Mobile Computing | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| **EMPLOYABILITY ENHANCEMENT COURSE** | | | | | | | | | |
| 7 | | Soft skills- I | EEC | 100 | -- | 2 | 1 | 0 | 0 |
| **Total** | | | | | | **17** | **1** | **12** | **21** |

## SEMESTER VI

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | | Artificial Intelligence | PC | 40 | 60 | 3 | 1 | 0 | 4 |
| 2 | | Open Elective - III | OE | 40 | 60 | 3 | 0 | 0 | 3 |
| 3 | | Professional Elective - II | PE | 40 | 60 | 3 | 0 | 0 | 3 |
| **THEORY COURSES WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 4 | | Professional Elective - III | PE | 50 | 50 | 2 | 0 | 4 | 4 |
| 5 | | Compiler Design | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| 6 | | Object Oriented Analysis & Design | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| **EMPLOYABILITY ENHANCEMENT COURSE** | | | | | | | | | |
| 7 | | Soft skills - II | MC | 100 | -- | 2 | 1 | 0 | 0 |
| **Total** | | | | | | **17** | **2** | **12** | **22** |

## SEMESTER VII

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | | Machine Learning | PC | 40 | 60 | 3 | 0 | 0 | 3 |
| **THEORY COURSES WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 2 | | Professional Elective - IV | PE | 50 | 50 | 2 | 0 | 4 | 4 |
| 3 | | Professional Elective - V | PE | 50 | 50 | 2 | 0 | 4 | 4 |
| 4 | | Cryptography & Network Security | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| 5 | | Cloud Computing | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| **LABORATORY COURSES** | | | | | | | | | |
| 6 | | Project Work Phase-I | EEC | 100 | - | 0 | 0 | 10 | 3 |
| **Total** | | | | | | **11** | **0** | **26** | **22** |

## SEMESTER VIII

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **LABORATORY COURSES** | | | | | | | | | |
| 1 | | Project Work Phase-II | EEC | 60 | 40 | 0 | 0 | 24 | 12 |
| 2 | | Industrial Training / Internship | EEC | 100 | - | 4 Weeks | | | 1 |
| **Total** | | | | | | **0** | **0** | **24** | **13** |

**Total Credits: 166**

## HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT (HS)

| S. No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 23EN1LT2 | Communicative English | 3 | 0 | 2 | 4 |
| 2 | 23EN2T1 | Technical English | 3 | 0 | 0 | 3 |
| 3 | 23EN3L1 | Inter Personal Communication Skills Laboratory -I | 0 | 0 | 3 | 1.5 |
| 4 | 23EN4L1 | Inter Personal Communication Skills Laboratory –II | 0 | 0 | 3 | 1.5 |
| 5 | 23HS4T1 | Universal Human value 2:Understanding Harmony | 2 | 1 | 0 | 3 |
| 6 | | Professional Ethics | 3 | 0 | 0 | 3 |

## BASIC SCIENCES (BS)

| Sl.No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 23MA1T1 | Calculus & Differential Equations | 3 | 1 | 0 | 4 |
| 2 | 23PH1LT3 | Engineering Physics | 3 | 1 | 2 | 5 |
| 3 | 23CY1LT4 | Engineering Chemistry | 3 | 1 | 2 | 5 |
| 4 | 23MA2T4 | Algebra & Number Theory | 3 | 1 | 0 | 4 |
| 5 | 23MA3T2 | Probability and Queuing Theory | 3 | 1 | 0 | 4 |

## ENGINEERING SCIENCES (ES)

| Sl.No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 23CS1LT5 | Problem solving and C Programming | 3 | 0 | 4 | 5 |
| 2 | 23CS2LT1 | Python Programming | 3 | 0 | 4 | 5 |
| 3 | 23EE2LT2 | Basics of Electrical and Electronics Engineering | 3 | 0 | 4 | 5 |
| 4 | 23EC3T4 | Digital Principles and System Design | 3 | 0 | 0 | 3 |

## PROFESSIONAL CORE (PC)

| Sl.No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 23CS3T3 | User Interface Design | 3 | 1 | 0 | 4 |
| 2 | 23CS3LT1 | Object Oriented Programming With java | 2 | 0 | 4 | 4 |
| 3 | 23CS3LT2 | Data Structures and Algorithms | 2 | 0 | 4 | 4 |
| 4 | 23CS4T2 | Software Engineering | 3 | 0 | 0 | 3 |
| 5 | 23CSCT4 | Computer Organization and Architecture | 3 | 0 | 0 | 3 |
| 6 | 23CS4LT1 | Database Management Systems | 2 | 0 | 4 | 4 |
| 7 | 23CS4LT2 | Operating Systems | 2 | 0 | 4 | 4 |
| 8 | 23CS4LT3 | Internet Programming | 2 | 0 | 4 | 4 |
| 9 | | Internet of Things | 2 | 0 | 4 | 4 |
| 10 | | Computer Network | 2 | 0 | 4 | 4 |
| 11 | | Mobile Computing | 2 | 0 | 4 | 4 |
| 12 | | Artificial Intelligence | 3 | 1 | 0 | 4 |
| 13 | | Compiler Design | 2 | 0 | 4 | 4 |
| 14 | | Object Oriented Analysis & Design | 2 | 0 | 4 | 4 |
| 15 | | Machine Learning | 3 | 0 | 0 | 3 |
| 16 | | Cryptography & Network Security | 2 | 0 | 4 | 4 |
| 17 | | Cloud Computing | 2 | 0 | 4 | 4 |

## PROFESSIONAL ELECTIVES (PE)

| Vertical–I (Data Science) | | | | | | |
|---|---|---|---|---|---|---|
| **PE.NO.** | **Course Code** | **Course Title** | **L** | **T** | **P** | **C** |
| PE I | | Exploratory DataAnalysis | 3 | 0 | 0 | 3 |
| PE II | | Business Analytics | 3 | 0 | 0 | 3 |
| PE III | | Image and Video Analytics | 2 | 0 | 4 | 4 |
| PE IV | | Computer Vision | 2 | 0 | 4 | 4 |
| PE V | | Big Data Analytics | 2 | 0 | 4 | 4 |

| Vertical–II (Cloud Computing and Data Center Technologies) | | | | | | |
|---|---|---|---|---|---|---|
| **PE.NO** | **Course Code** | **Course Title** | **L** | **T** | **P** | **C** |
| PE I | | Data Warehousing | 3 | 0 | 0 | 3 |
| PE II | | Software Defined Networks | 3 | 0 | 0 | 3 |
| PE III | | Cloud Services Management | 2 | 0 | 4 | 4 |
| PE IV | | Storage Technologies | 2 | 0 | 4 | 4 |
| PE V | | Security and Privacy in Cloud | 2 | 0 | 4 | 4 |

| Vertical–III (Cyber Security and Data Privacy) | | | | | | |
|---|---|---|---|---|---|---|
| **PE.NO** | **Course Code** | **Course Title** | **L** | **T** | **P** | **C** |
| PE I | | Ethical Hacking | 3 | 0 | 0 | 3 |
| PE II | | Digital and Mobile Forensics | 3 | 0 | 0 | 3 |
| PE III | | Security and Privacy in Cloud | 2 | 0 | 4 | 4 |
| PE IV | | Modern Cryptography | 2 | 0 | 4 | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| PE V | | Crypto currency and Block chain Technologies | 2 | 0 | 4 | 4 |

| Vertical–IV (Creative Media) | | | | | | |
|---|---|---|---|---|---|---|
| **PE.NO** | **Course Code** | **Course Title** | **L** | **T** | **P** | **C** |
| PE I | | Augmented Reality/Virtual Reality | 3 | 0 | 0 | 3 |
| PE II | | Digital marketing | 3 | 0 | 0 | 3 |
| PE III | | Multimedia Data Compression and Storage | 2 | 0 | 4 | 4 |
| PE IV | | UI and UX Design | 2 | 0 | 4 | 4 |
| PE V | | Video Creation and Editing | 2 | 0 | 4 | 4 |

| Vertical–V (Artificial Intelligence and Machine Learning) | | | | | | |
|---|---|---|---|---|---|---|
| **PE.NO** | **Course Code** | **Course Title** | **L** | **T** | **P** | **C** |
| PE I | | Knowledge Engineering | 3 | 0 | 0 | 3 |
| PE II | | Optimization Techniques | 3 | 0 | 0 | 3 |
| PE III | | Text and Speech Analysis | 2 | 0 | 4 | 4 |
| PE IV | | Neural Networks and Deep Learning | 2 | 0 | 4 | 4 |
| PE V | | Game Theory | 2 | 0 | 4 | 4 |

## OPEN ELECTIVES (OE)

| Sl.No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1. | | Open Elective-I | 3 | 0 | 0 | 3 |
| 2. | | Open Elective-II | 3 | 0 | 0 | 3 |
| 3. | | Open Elective-III | 3 | 0 | 0 | 3 |

## EMPLOYABILITY ENHANCEMENT COURSES (EEC)

| Sl. No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | | Soft skills- I | 2 | 1 | 0 | 0 |
| 2 | | Soft skills- II | 2 | 1 | 0 | 0 |
| 3 | | Project Work Phase - I | 0 | 0 | 10 | 3 |
| 4 | | Project Work Phase - II | 0 | 0 | 24 | 12 |
| 5 | | Internship | 2 Weeks | | | 1 |

## MANDATORY COURSES (MC)

| Sl.No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1. | | Universal Human Values 1 - Induction Programme | 0 | 0 | 0 | 0 |
| 2. | 23HS1T6 | Heritage of Tamil | 1 | 0 | 0 | 1 |
| 3. | 23HS2T2 | Environmental Sciences | 3 | 0 | 0 | 0 |
| 4. | 23HS2T3 | Tamil And Technology | 1 | 0 | 0 | 1 |
| 5. | 23HS3T1 | Constitution of India | 3 | 0 | 0 | 0 |

## VALUE ADDED COURSES (VAC)

| S.No. | Course Code | Course Title | Credits |
|---|---|---|---|
| 1. | | J2EE | 3 |
| 2. | | Php, Mysql | 2 |
| 3. | | Android Application Development | 2 |
| 4. | | Arduino | 3 |
| 5. | | Hardware And Network Trouble Shooting | 2 |
| 6. | | Ethical Hacking | 3 |
| 7. | | Web Designing | 2 |

## OPEN ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS (OE)

| Sl. No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1. | | Fundamentals of Databases | 3 | 0 | 0 | 3 |
| 2. | | Python Programming and Frameworks | 3 | 0 | 0 | 3 |
| 3. | | Data Structures | 3 | 0 | 0 | 3 |
| 4. | | Computational Science for Engineers | 3 | 0 | 0 | 3 |
| 5 | | Java Programming | 3 | 0 | 0 | 3 |
| 6 | | Web Engineering | 3 | 0 | 0 | 3 |
| 7 | | Fundamentals of Blockchain | 3 | 0 | 0 | 3 |
| 8 | | Introduction to Artificial Intelligence | 3 | 0 | 0 | 3 |
| 9 | | Fundamentals of Internet of Things | 3 | 0 | 0 | 3 |
| 10 | | Cloud Technology | 3 | 0 | 0 | 3 |

## CURRICULUM BREAKDOWN STRUCTURE

| Subject | AICTE suggested breakdown of credits | Total number of credits | Curriculum Content (% of total number of credits of the program) |
|---|---|---|---|
| Humanities and Social Sciences including Management (HS) | **16** | **16** | **9.6** |
| Basic Sciences (BS) | **23** | **22** | **13.2** |
| Engineering Sciences (ES) | **29** | **18** | **10.8** |
| Professional Core (PC) | **59** | **65** | **39.1** |
| Program Electives (PE) | **12** | **18** | **10.8** |
| Open Electives (OE) | **9** | **9** | **5.4** |
| Employability Enhancement Courses (EEC) – Practical Courses and Project Work | **15** | **16** | **9.6** |
| Mandatory Courses (MC) | **0** | **2** | **1.2** |
| **Total** | **163** | **166** | **100.00** |

## CREDIT SUMMARY

| Sl. No. | Subject Area | Credits per Semester | | | | | | | | Total Credits | AICTE Suggested Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | | |
| 1 | **HS** | 4 | 3 | 1.5 | 4.5 | 3 | | | | **16** | **16** |
| 2 | **BS** | 14 | 4 | 4 | | | | | | **22** | **23** |
| 3 | **ES** | 5 | 10 | 3 | | | | | | **18** | **29** |
| 4 | **PC** | | | 12 | 18 | 12 | 12 | 11 | | **65** | **59** |
| 5 | **PE** | | | | | 3 | 7 | 8 | | **18** | **12** |
| 6 | **OE** | | | | 3 | 3 | 3 | | | **9** | **9** |
| 7 | **EEC** | | | | | | | 3 | 13 | **16** | **15** |
| 8 | **MC** | 1 | 1 | | | | | | | **2** | **0** |
| **TOTAL** | | **24** | **18** | **20.5** | **25.5** | **21** | **22** | **22** | **13** | **166** | **163** |

**HS** – Humanities and Social Sciences including Management
**BS** – Basic Sciences
**ES –** Engineering Sciences
**PC –** Professional Core
**PE –** Professional Electives
**OE –** Open Electives
**EEC –** Employability Enhancement Courses
**MC** – Mandatory Courses

## CURRICULUM

## SEMESTER I

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | 23MA1T1 | Calculus & Differential Equations | BS | 40 | 60 | 3 | 1 | 0 | 4 |
| **THEORY COURSES WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 2 | 23EN1LT2 | Communicative English | HS | 50 | 50 | 3 | 0 | 2 | 4 |
| 3 | 23PH1LT3 | Engineering Physics | BS | 50 | 50 | 3 | 1 | 2 | 5 |
| 4 | 23CY1LT4 | Engineering Chemistry | BS | 50 | 50 | 3 | 1 | 2 | 5 |
| 5 | 23CS1LT5 | Problem Solving and C Programming | ES | 50 | 50 | 3 | 0 | 4 | 5 |
| **MANDATORY COURSE** | | | | | | | | | |
| 6 | | Universal Human Values 1 – Induction Programme | MC | - | - | - | - | - | - |
| 7 | 23HS1T6 | Heritage of Tamil | MC | 100 | - | 1 | 0 | 0 | 1 |
| **Total** | | | | | | **16** | **3** | **10** | **24** |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| I | B.E. / B.Tech., Common to all | 23MA1T1 | CALCULUS AND DIFFERENTIAL EQUATIONS | 3 | 1 | 0 | 4 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Apply Eigen values and eigenvectors to convert quadratic form to canonical form through orthogonal diagonalization. | K3 | 1 |
| **CO2** | Understand the basic concepts of derivatives to estimate maxima and minima of multivariable functions. | K2 | 2 |
| **CO3** | Identify appropriate integral techniques to find area and volume of the given region | K3 | 3 |
| **CO4** | Apply various integral theorems for solving engineering problems involving cubes and parallelepipeds. | K3 | 4 |
| **CO5** | Solve first order Ordinary Differential Equations and apply them to certain physical situations. | K3 | 5 |

| PRE-REQUISITE | NIL |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO2 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO3 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO4 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO5 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| | 2 | Other Assessments (Assignment, Quiz, etc.) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **MATRICES** | **9 + 3** |
| Eigen values and Eigen vectors – properties (without proof) – Cayley Hamilton theorem (Without proof) –Diagonalization using orthogonal transformation. | | |
| **Topic - 2** | **FUNCTIONS OF SEVERAL VARIABLES** | **9 + 3** |
| Partial derivatives – Total derivative – Jacobians - Taylor's series expansion – Extreme values of functions of two variables – Lagrange's multipliers method. | | |
| **Topic - 3** | **MULTIPLE INTEGRALS** | **9 + 3** |
| Double integrals – Change of order of integration – Triple integrals – Applications in area and volumes. | | |
| **Topic - 4** | **LINE AND SURFACE INTEGRALS** | **9 + 3** |
| Gradient, Divergence and curl– Directional Derivative – Irrotational and solenoidal vector fields – Green's theorem – Green's theorem in a plane – Gauss divergence theorem – Stokes theorem (excluding proof). | | |
| **Topic - 5** | **ORDINARY DIFFERENTIAL EQUATION** | **9 + 3** |
| Second and higher order linear differential equations with Constant coefficients – Variable coefficients – Euler Cauchy equation – Legendre's equation – Method of variation of Parameters – Simple Applications. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **45** | | **TUTORIAL** | **15** | | **PRACTICAL** | **0** | | **TOTAL** | **60** |

| BOOK REFERENCES | |
|---|---|
| 1 | Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 5rd Edition, Narosa Publishing House, New Delhi, Reprint 2019. |
| 2 | Ramana B.V., "Higher Engineering Mathematics", Tata Mcgraw Hill Publishing Company, New Delhi, 2017. |
| 3 | Kreyszig E., "Advanced Engineering Mathematics", 10th Edition, John Wiley Sons, 2012.(E-BOOK) |
| 4 | Glyn James., "Advanced Modern Engineering Mathematics", Pearson Education Limited, 2018. |
| 5 | N P Bali, Manish Goyal, "A Text Book of Engineering Mathematics", 9rd Edition, Laxmi Publication Private Limited, 2010. |
| 6 | Grewal B.S., "Higher Engineering Mathematics", 43nd Edition,Khanna Publications New Delhi, 2015 |

| OTHER REFERENCES | |
|---|---|
| 1 | https://www.slideshare.net/mailrenuka/matrices-and-application-of-matrices |
| 2 | https://testbook.com/maths/application-of-vector#:~:text=Application%20of%20Vector%20Calculus,gravitational%20fields%2C%20and%20fluid%20flow.&text=To%20find%20the%20rate%20of,mass%20of%20a%20fluid%20flows. |
| 3 | https://youtu.be/wtuq1oSButE |
| 4 | https://www.slideshare.net/abhinavsomani3/applications-of-maths-in-our-daily-life-41607055 |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| I | B.E. / B.Tech., Common to all | 23EN1LT2 | COMMUNICATIVE ENGLISH | 3 | 0 | 2 | 4 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Improve communication skills and language comprehension with error-free strategies. | K2 | 1 |
| **CO2** | Analyze the effectiveness of soft skills in different scenarios. | K3 | 2 |
| **CO3** | Explore the fascinating world of word-stress, sentence stress and intonation. | K4 | 3 |
| **CO4** | Enhance reading and writing skills to excel in career. | K4 | 4 |
| **CO5** | Develop strong public speaking abilities. | K2 | 5 |

| PRE-REQUISITE | NIL |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO2 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO3 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO4 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO5 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **LANGUAGE INTROSPECTION** | **9** |
| **GRAMMAR COMPONENTS:** Vocabulary Building - Word Formation–Prefixes and Suffixes– 'Wh' questions and Yes or No questions.<br>**LINGUISTIC FUNCTIONS:** Short comprehension Passages –Skimming and Scanning-Developing hints | | |
| **Topic - 2** | **SOFT SKILLS** | **9** |
| **GRAMMAR COMPONENTS:** Sentence structures- Punctuation – Kinds of sentences - Subject-verb Agreement.<br>**LINGUISTIC FUNCTIONS:** Introducing and Sharing Information from Newspaper including Dialogues and Conversations– Short Narrative Descriptions – Paragraph Writing – Greeting- Jumbled Sentences- | | |
| **Topic - 3** | **CAREER GUIDANCE** | **9** |
| **GRAMMAR COMPONENTS:** Single-word substitutes –Pronouns – Degrees of Comparison<br>**LINGUISTIC FUNCTIONS:** Reading Comprehension – Verbal and Non-verbal Communication –Public Speaking - Describing and Classification of Different Kinds of Innovation – Narration Act. (Language through Literature)- Negotiation Skills. | | |
| **Topic - 4** | **TECHNICAL WRITING** | **9** |
| **GRAMMAR COMPONENTS:** Articles- Modal Verbs – Uses of Prepositions (of Time, Place, Direction and Spatial Relations)<br>**LINGUISTIC FUNCTIONS:** Preparing Instructions and Manuals - Reporting Events and Research – Writing Recommendations – Interpreting Diagrammatic Representations, esp. Bar Graphs and Pie Charts. | | |
| **Topic - 5** | **BUSINESS CORRESPONDENCE** | **9** |
| **GRAMMAR COMPONENTS:** Numerical Adjectives –Phrases and Clauses- Synonyms and Antonyms- Different Tense Forms of Verbs.<br>**LINGUISTIC FUNCTIONS:** Writing short Essays- Dialogue Writing- Technical and Business Proposals – Role play – Narrating Incidents – Extempore and persuasive speech- Conversations - Telephonic Conversations. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **45** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **45** |

| LIST OF EXPERIMENTS | |
|---|---|
| 1 | Self-introduction and introducing others |
| 2 | Negotiation Skills |
| 3 | Public Speaking |
| 4 | Body Language |
| 5 | Narrating incidents |
| 6 | Telephonic Conversation |
| 7 | Representations |
| 8 | Technical Proposals |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **0** | | **TUTORIAL** | **0** | | **PRACTICAL** | **30** | | **TOTAL** | **30** |

| BOOK REFERENCES | |
|---|---|
| 1 | Technical English 1 Paperback – 15 December 2019 by Prof. Ravindra Nath Tiwari (Author) |
| 2 | Developing English Language Skills-I: (NEP 2020 for the University of Delhi) by Pooja Khanna |
| 3 | Sem-I Communication Skills I Edition/Reprint: 2022 Author(s): B.v.pathak Publisher: **NIRALI PRAKASHAN** Product ID: 591991 |
| 4 | Sem-1 Communication Skills (English) ISBN: 9788119883493 Edition/Reprint: 2023-24 Author(s): Dr. Yogesh Malshette Publisher: **NIRALI PRAKASHAN** Product ID: 626280 |
| 5 | English Language & Comprehension (Useful For Graduate Level) ISBN: 9789386791672 Edition/Reprint: 2022 Author(s): Editorial Board Publisher: UPKAR PRAKASHAN Product ID: 514358 Country of Origin: India |
| 6 | Communication Skills in English\| AICTE Prescribed Textbook (English) DIP122EN Paperback – Big Book, 1 January 2022by Anjana Tiwari (Author) |

| BOOK REFERENCES | |
|---|---|
| 1 | Avadhanulu M N, Kshirsagar P G and Arun Murthy TVS, "A Text book of Engineering Physics", 2nd Edition, S Chand Publishing, New Delhi, 2022 |
| 2 | Dr.G.Senthilkumar " Engineering Physics-1" Revised & Animated Version, VRB Publishers Pvt.Ltd.,2017 |
| 3 | Dr.R.Suresh " A Text book of Engineering Physics", 2nd Edition, Sri Krishna Hi-tech Publishing Pvt, Ltd., Chennai,2019. |
| 4. | Dr.P.Mani " A Text book of Engineering Physics",Dhanam Publications.,Chennai.,2022. |
| 5. | Dr.M.Arumugam " A Text book of Engineering Physics", Anuradha Publications.,Chennai.,2020. |
| 6. | Serway and Jewett, "Physics for Scientists and Engineers with Modern Physics", 6th Edition, Thomson Brooks Cole, 2008 |

| OTHER REFERENCES | |
|---|---|
| 1 | https://youtu.be/x60GHpQ8gJk?list=PLWPirh4EWFpFIElSxplDlEhRDZHkBD-0n |
| 2 | https://youtu.be/BO7j-X87rM8 |
| 3 | https://youtu.be/QMIQv7yPlkI |
| 4 | https://www.youtube.com/live/zb07Wo9_2Lc?si=nnPc83pP-gFHvRfD |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| I | B.E. / B.Tech., Common to all | 23PH1LT3 | ENGINEERING PHYSICS | 3 | 1 | 2 | 5 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Utilize the conceived concepts and techniques for synthesizing novel crystals. | K2 | 1 |
| **CO2** | Classify the extensive properties of solid materials to use it in material fabrication field. | K2 | 2 |
| **CO3** | Understand the principles of thermodynamics and apply it in real systems. | K2 | 3 |
| **CO4** | Analyze the properties of the Laser beam and apply it in industrial and medical field. | K3 | 4 |
| **CO5** | Apply advanced technical methods by assessing the fibre optics. | K3 | 5 |

| PRE-REQUISITE | NIL |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 2 | 1 | 2 | - | - | 1 | 3 | 2 | 1 | 2 | - | - |
| CO2 | 3 | 2 | 2 | 2 | 2 | - | - | 1 | 3 | 2 | 1 | 2 | - | - |
| CO3 | 3 | 2 | 2 | 1 | 2 | - | - | 1 | 3 | 2 | 1 | 2 | - | - |
| CO4 | 3 | 2 | 2 | 2 | 2 | - | - | 1 | 3 | 2 | 1 | 2 | - | - |
| CO5 | 3 | 2 | 2 | 1 | 2 | - | - | 1 | 3 | 2 | 1 | 2 | - | - |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **CRYSTAL PHYSICS** | **9+3** |
| Unit cell-Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - growth of single crystals: solution and melt growth techniques. | | |
| **Topic - 2** | **PROPERTIES OF MATTER** | **9+3** |
| Hooke's Law - Stress-Strain Diagram - Elastic moduli - Poisson's Ratio - Expression for bending moment of beam and depression of Cantilever - Expression for Young's modulus by Non-uniform bending and its experimental determination. | | |
| **Topic - 3** | **THERMAL PHYSICS** | **9+3** |
| Transfer of heat energy - thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity - Lee‘s disc method - theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters. | | |
| **Topic - 4** | **LASER TECHNOLOGY** | **9+3** |
| Laser characteristics -Spontaneous emission and stimulated emission-Einstein’s coefficients-Pumping methods-Components of a laser -$CO_2$ laser-Solid state laser(Nd:YAG)-Semiconductor diode lasers –Application of laser in science and technology. | | |
| **Topic - 5** | **FIBER OPTICS** | **9+3** |
| Fiber optical communication system – Structure of an optical fiber- Numerical aperture and acceptance angle-Classification of optical fibers (Materials, modes and refractive index profile)- Displacement and temperature sensor- Medical Endoscopy. | | |

| **THEORY** | **45** | **TUTORIAL** | **15** | **PRACTICAL** | **00** | **TOTAL** | **60** |
|---|---|---|---|---|---|---|---|

**LIST OF EXPERIMENTS**

1. Determination of Young’s modulus by non- uniform bending.
2. Determination of Young’s modulus by uniform bending.
3. Torsional pendulum - determination of moment of inertia and rigidity modulus.
4. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
5. Determination of Wavelength, and particle size using Laser.
6. Determination of thermal conductivity of a bad conductor using Lee’s disc method.
7. Air wedge – determination of thickness of a thin wire.
8. Determination of acceptance angle and numerical aperture of an optical fiber.

| **THEORY** | **00** | **TUTORIAL** | **00** | **PRACTICAL** | **30** | **TOTAL** | **30** |
|---|---|---|---|---|---|---|---|

| BOOK REFERENCES | |
|---|---|
| 1 | Avadhanulu M N, Kshirsagar P G and Arun Murthy TVS, "A Text book of Engineering Physics", 2nd Edition, S Chand Publishing, New Delhi, 2022 |
| 2 | Dr.G.Senthilkumar " Engineering Physics-1" Revised & Animated Version, VRB Publishers Pvt.Ltd.,2017 |
| 3 | Dr.R.Suresh " A Text book of Engineering Physics", 2nd Edition, Sri Krishna Hi-tech Publishing Pvt, Ltd., Chennai,2019. |
| 4. | Dr.P.Mani " A Text book of Engineering Physics",Dhanam Publications.,Chennai.,2022. |
| 5. | Dr.M.Arumugam " A Text book of Engineering Physics", Anuradha Publications.,Chennai.,2020. |
| 6. | Serway and Jewett, "Physics for Scientists and Engineers with Modern Physics", 6th Edition, Thomson Brooks Cole, 2008 |

| OTHER REFERENCES | |
|---|---|
| 1 | https://nptel.ac.in/courses/115/105/115105099/ |
| 2 | https://nptel.ac.in/courses/115/106/115106061/ |
| 3 | https://www.youtube.com/watch?v=_JOchLyNO_w |
| 4 | https://www.journals.elsevier.com › Journals |
| 5 | https://nptel.ac.in/courses/118/104/118104008/ |
| 6 | https://www.digimat.in/nptel/courses/video/122107035/L37.html |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| I | B.E. / B.Tech., Common to all | 23CY1LT4 | ENGINEERING CHEMISTRY | 3 | 1 | 2 | 5 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Apply the suitable water softening methods to avoid boiler troubles. | K3 | 1 |
| **CO2** | Analyze the calorific value of different types of fuels. | K2 | 2 |
| **CO3** | Choose suitable forms of energy sources for applying it in energy sectors. | K2 | 3 |
| **CO4** | Understand the working process of spectroscopy to analyse the wavelength of electromagnetic radiations. | K3 | 4 |
| **CO5** | Classify the types of polymers for fabrication. | K3 | 5 |

| PRE-REQUISITE | NIL |
|---|---|

**CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)**

| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 1 | 2 | - | - | 2 | 1 | 2 | 2 | 2 | 2 | - | - |
| CO2 | 3 | 2 | 1 | 1 | - | - | 2 | 1 | 2 | 2 | 2 | 2 | - | - |
| CO3 | 3 | 2 | 2 | 1 | - | - | 3 | 1 | 2 | 2 | 2 | 2 | - | - |
| CO4 | 3 | 2 | 2 | 1 | 1 | - | 1 | 1 | 2 | 2 | 2 | 2 | - | - |
| CO5 | 3 | 2 | 1 | 2 | - | - | 1 | 1 | 2 | 2 | 2 | 2 | - | - |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **WATER CHEMISTRY** | **9+3** |
| Hardness of water – Types – Units – Boiler troubles (Scale and Sludge, Priming and Foaming and Caustic Embrittlement) – Treatment of boiler feed water – Internal treatment (Phosphate, Colloidal and Calgon conditioning) and External treatment (Ion exchange process and Zeolite process) – Desalination of brackish water – Reverse Osmosis. | | |
| **Topic - 2** | **FUELS** | **9+3** |
| Fuels: Introduction - Classification of fuels – Coal – Analysis of coal (Proximate and Ultimate Analysis) - Carbonization - Manufacture of metallurgical coke (Otto Hoffmann method) - Petroleum – Bergius Process - Knocking - Octane number - Diesel oil - Cetane number - Natural gas - Compressed natural gas (CNG) - Liquefied petroleum gases (LPG) - Power alcohol. | | |
| **Topic - 3** | **BATTERIES AND FUEL CELLS** | **9+3** |
| Batteries - Types of batteries – primary battery - dry cell. Secondary battery - lead acid battery, Nickel-Cadmium battery - Lithium Batteries - Fuel cells – Hydrogen -Oxygen fuel cell. - Solar energy conversion - solar cells – Application. | | |
| **Topic - 4** | **SPECTROSCOPY** | **9+3** |
| Introduction – Laws of spectroscopy - Block diagram, Instrumentation, Working and application of Visible spectroscopy and Ultra Violet spectroscopy – Infrared spectroscopy – Flame photometry – Atomic adsorption spectroscopy. | | |
| **Topic - 5** | **ENGINEERING MATERIALS** | **9+3** |
| Polymer – Types of polymerization – Preparation, properties, uses of Nylon(6,6), Poly Vinyl Chloride (PVC). Plastics – Types - Rubbers – SBR – Nanomaterials – Synthesis and its applications of Nanomaterials. Abrasives – Classification, Properties - Manufacture of SiC. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **45** | | **TUTORIAL** | **15** | | **PRACTICAL** | **0** | | **TOTAL** | **60** |

**LIST OF EXPERIMENTS**

1. Estimation of total hardness in water by EDTA method.
2. Determination of viscosity coefficient of a given oil / fuel / polymer using Ostwald's viscometer.
3. Estimation of Ferrous Ammonium Sulfate (FAS) using standard potassium Dichromate solution potentiometrically.
4. Estimation of sodium / potassium present in water using photometer.
5. Synthesis of Polymers (Phenol Formaldehyde or Urea Formaldehyde Resins).
6. Conductometric estimation of Strong Acid and Weak acid from a given mixture.
7. Determination of chloride content of water sample by Argentometric method.
8. Determination of strength of given hydrochloric acid using pH meter.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **0** | | **TUTORIAL** | **0** | | **PRACTICAL** | **30** | | **TOTAL** | **30** |

| BOOK REFERENCES | |
|---|---|
| 1 | S.S Dara and S.S. Umare ‘ A Textbook of Engineering Chemistry for Anna University’, S.Chand Publication, 2020 |
| 2 | Shikha Agarwal, “Engineering Chemistry-Fundamentals and Applications”, Cambridge University Press, Delhi, Second Edition, 2019 |
| 3 | “Engineering Chemistry” by Dr.A.Ravikrishna, Sri Krishna Hi Tech Publishing Company, 2021 |
| 4 | “Experiments In Engineering Chemistry” – Payal B Joshi, I.K. International Publishing House. 2016 |
| 5 | Group Theory and Spectroscopy by Pragati Prakashan Alka L Gupta and Mukesh Kumar Alka L Gupta and Mukeshkumar ,2021 |
| 6 | Anil Kumar P.V Polymer Chemistry, First Edition -2021 |

| OTHER REFERENCES | |
|---|---|
| 1 | https://sctevtodisha.nic.in/wp-content/uploads/2021/03/Engineering-Chemistry-1ST-YEAR-LM.pdf |
| 2 | https://www.youtube.com/watch?v=Fyq4Q5yWDDU&list=PLyqSpQzTE6M927gXIZdVbbsyj9cmxam-b |
| 3 | https://www.youtube.com/watch?v=nh2xbyOaERw |
| 4 | https://archive.nptel.ac.in/courses/104/106/104106122/ |
| 5 | https://nptel.ac.in/courses/118104008 |
| 6 | https://www.britannica.com/science/water |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| I | B.E. CSE & B.TECH. IT | 23CS1LT5 | PROBLEM SOLVING AND C PROGRAMMING | 3 | 0 | 4 | 5 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Understand the basic concepts to write efficient C program. | K2 | 1 |
| **CO2** | Implement the identified looping and control statements in C program for developing applications. | K2 | 2 |
| **CO3** | Understand the concepts of arrays and strings to develop C program with different dimensions. | K2 | 3 |
| **CO4** | Write and implement C programs using user defined functions. | K2 | 4 |
| **CO5** | Apply dynamic memory allocation functions for assigning memory space during execution. | K3 | 5 |

| PRE-REQUISITE | NIL |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 3 | - | - | - | 2 | 2 | 3 | 3 | 2 | 3 | - | - |
| CO2 | 1 | 2 | 3 | 2 | 2 | - | 2 | 2 | 3 | 3 | - | 3 | - | 2 |
| CO3 | 3 | 2 | 2 | - | - | - | 2 | 2 | 3 | 3 | 2 | 3 | - | 2 |
| CO4 | 1 | 3 | 2 | 2 | - | - | 2 | 2 | 3 | 3 | - | 3 | 2 | - |
| CO5 | 3 | 2 | - | - | - | - | 2 | 2 | 3 | 3 | 3 | 3 | - | 2 |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **PROBLEM SOLVING AND C PROGRAMMING BASICS** | **9** |
| General Problem Solving: Algorithms, Flowcharts and Pseudo-codes, implementation of algorithms<br>Basics of C Programming : Introduction to C - Structure of C program - Programming Rules –<br>Compilation – Errors - C Declarations: Tokens - keywords - identifiers - constants - data types - variable declaration and initialization - type conversion - constant and volatile variables - operators and expressions. | | |
| **Topic - 2** | **DECISION CONTROL STATEMENTS** | **9** |
| Managing Input and Output operations, Decision Control Statements: Decision control statements,<br>Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. Basic loop<br>Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops break and continue statements. | | |
| **Topic - 3** | **ARRAYS AND STRINGS** | **9** |
| Introduction to Array - Definition - Array initialization - Characteristics - One Dimensional Array - Array operations - Two dimensional arrays -Strings and String handling functions. | | |
| **Topic - 4** | **FUNCTIONS** | **9** |
| Functions: Basics - definition - Elements of User defined Functions - return statement, Function types,<br>Parameter Passing Techniques, Function returning more values - Passing Array to Functions - Recursion -Storage classes. | | |
| **Topic - 5** | **POINTERS AND FILE MANAGEMENT** | **9** |
| Pointer concepts - Pointers & Arrays, Structure concepts - Defining, Declaring, Accessing Member Variables, Structure within Structure - Union - File Management in C- Dynamic Memory allocation. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **45** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **45** |

| COURSE CONTENT | |
|---|---|
| **Experiment-1** | Draw the flowchart for the following using Raptor tool.<br>a) Simple interest calculation<br>b) Greatest among three numbers<br>c) Find the sum of digits of a number. |
| **Experiment-2** | Programs for demonstrating the use of different types of operators like arithmetic, logical, relational and ternary operators (Sequential and Selection structures). |
| **Experiment-3** | Programs for demonstrating repetitive control statements like ‘for’, ‘while’ and ‘do-while’ (Iterative structure). |
| **Experiment-4** | Programs for demonstrating one-dimensional and two-dimensional numeric array. |
| **Experiment-5** | Programs to demonstrate modular programming concepts using functions. |
| **Experiment-6** | Programs to implement various character and string operations with and without built-in library functions. |
| **Experiment-7** | Programs to demonstrate the use of pointers. |

| | |
|---|---|
| **Experiment-8** | Programs to illustrate the use of user-defined data types. |
| **Experiment-9** | Programs to implement various file management. |
| **Experiment-10** | Program Using Dynamic memory allocation functions. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **0** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **60** |

| **BOOK REFERENCES** | |
|---|---|
| 1 | Ashok N. Kamthane, “Programming in C”, 2nd Edition., Pearson Education, 2013. |
| 2 | Sumitabha Das, “Computer Fundamentals and C Programming”, 1st Edition, McGraw Hill, 2018. |
| 3 | Yashavant Kanetkar, "Let us C", 16th Edition, BPB Publications, 2018. |
| 4. | C programming for problem solving. Paperback – Import, 9 October 2020 by Sukhendra Singh (Author), Hemant Jain (Author) |
| 5. | Let Us C: Authentic guide to C programming language - 19th Edition Paperback – 15 December 2022 by Yashavant Kanetkar (Author) |

| **OTHER REFERENCES** | |
|---|---|
| 1 | R. G. Dromey, “How to Solve it by Computer”, Pearson Education India; 1st edition, ISBN10: 8131705625, ISBN-13: 978-8131705629. |
| 2 | Maureen Spankle, “Problem Solving and Programming Concepts”, Pearson; 9th edition, India, ISBN10: 9780132492645, ISBN-13: 978- 013249264. |
| 3 | ReemaThareja., “Programming in C ”, 2nd Edition, Oxford University Press, New Delhi, 2018. |
| 4 | Balagurusamy E., "Programming in ANSI C", 7th Edition, Mc Graw Hill Education, 2017. |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| I | B.E. / B.Tech., Common to all | 23HS1T6 | HERITAGE OF TAMILS | 1 | 0 | 0 | 1 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Understand the extensive literature of Tamil and its classical nature. | K2 | 1 |
| **CO2** | Understand the heritage of sculpture, painting and musical instruments of ancient people. | K2 | 2 |
| **CO3** | Review on folk and material arts of Tamil people. | K2 | 3 |
| **CO4** | Realization of thinai concepts trade and victory of chozha dynasty. | K2 | 4 |
| **CO5** | Understand the contribution of tamils in Indian freedom struggle, self esteem movement and siddha medicine. | K2 | 5 |

| PRE-REQUISITE | NIL |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO2 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO3 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO4 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO5 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **LANGUAGE AND LITERATURE** | **3** |
| Language Families in India – Dravidan 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 and Jainism in Tamil Land – Bakthi Literature Azhwars and Nayanmars – Forms of Minor Poetry – Development of Modern Literature in Tamil- Constribution of Bharathiyar and Bharathidhasan | | |
| **Topic - 2** | **HERITAGE –ROCK ART PAINTINGS TO MODENT ART-SCULPTURE** | **3** |
| Hero stone to modern sculpture – Bronze icons – Tribes and their handicrafts – Art of Temple car making – Massive Terracotta sculptures,Villages deities, Thiruvalluvar Statue at Kanyakumari, Making of Musical instruments – Mirudhangam , Parai, Veenai , Yazh and Nadhaswaram – Role of Temples in Social and Economic Life of Tamils | | |
| **Topic - 3** | **FOLK AND MARTIAL ARTS** | **3** |
| Therukoothu, Karagattam,Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils | | |
| **Topic - 4** | **THINAI CONCEPT OF TAMILS** | **3** |
| 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 | | |
| **Topic - 5** | **CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE** | **3** |
| 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 and Manuscripts – Print History of Tamil Books | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **15** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **15** |

| BOOK REFERENCES | |
|---|---|
| 1 | தமிழக வரலாறு –மக்களும் பண்பாடும் கேகே பிள்ளை (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம் ) |
| 2 | கணினித் தமிழ் – முனைவர். இல. சுந்தரம் (விகடன் பிரசுரம்) |
| 3 | கீழடி வைகை நதி கரையில் சங்க கால நகர நாகரிகம் தொல்லியல் துறை வெளியீடு |
| 4 | Social Life of Tamils(Dr.K.K.Pillai) A joint publication of TNTB and ESC and RMRL – (in print) |
| 5 | Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) Published by International Institute of Tamil Studies. |
| 6 | The Contribution of the Tamils to Indian Culture ( Dr.M.Valarmathi ) Published by International Institute of Tamil Studies. |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| I | B.E. / B.Tech., Common to all | 23HS1T6 | தமிழர் மரபு | 1 | 0 | 0 | 1 |

| பாடம்கற்றதின்விளைவுகள் | | | |
|---|---|---|---|
| **After Successful completion of the course, the students should be able to** | | **RBT Level** | **Topics Covered** |
| **CO1** | தமிழ் மொழியின் செந்தன்மை மற்றும் இலக்கியங்கள் குறித்து தெரிதல் புரிதல்.. | K2 | 1 |
| **CO2** | தமிழர்களின் சிற்பக்கலை ஓவியக்கலை மற்றும் இசைக்கருவிகள் குறித்து தெளிவு புரிதல். | K2 | 2 |
| **CO3** | தமிழர்களின் நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுகள் குறித்து அறிமுகம் புரிதல். | K2 | 3 |
| **CO4** | தமிழர்களின் திணை கோட்பாடுகள் சங்க கால வணிகம் மற்றும் சோழர்களின் வெற்றிகள் குறித்த தகவல்கள் புரிதல். | K2 | 4 |
| **CO5** | இந்திய தேசிய இயக்கம் சுயமரியாதை இயக்கம் மற்றும் சித்த மருத்துவம் பற்றிய புரிதல். | K2 | 5 |

| **PRE-REQUISITE** | **NIL** |
|---|---|

| **CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **Programme Learning Outcomes (POs)** | | | | | | | | | | | | **PSOs** | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO2 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO3 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO4 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO5 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |

| **COURSE ASSESSMENT METHODS** | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| | 2 | Assignments |
| **INDIRECT** | 1 | Course Exit Survey |

| பாடத்திட்டங்கள் | | |
|---|---|---|
| **அலகு 1** | **மொழி மற்றும் இலக்கியம்** | **3** |
| இந்தியமொழிக்குடும்பங்கள்-திராவிடமொழிகள்-தமிழ்ஒருசெம்மொழி-<br>தமிழ்செவ்விலக்கியங்கள் –சங்க இலக்கியத்தின் சமயச்சார்பற்றதன்மை – சங்கஇலக்கியத்தில் பகிர்தல்அறம் –திருக்குறளில் மேலாண்மை கருத்துக்கள் -<br>தமிழ்க்காப்பியங்கள் –தமிழகத்தில் சமணபௌத்த சமயங்களின்தாக்கம்-பக்திஇலக்கியம்-<br>ஆழ்வார்கள்மற்றும்நாயன்மார்கள்-சிற்றிலக்கியங்கள்-<br>தமிழில்நவீனஇலக்கியத்தின்வளர்ச்சி-<br>தமிழ்இலக்கியவளர்ச்சியில்பாரதியார்மற்றும்பாரதிதாசன்ஆகியோரின்பங்களிப்பு | | |
| **அலகு 2** | **மரபுபாறைஓவியங்கள்முதல்நவீனஓவியங்கள்வரை-சிற்பக்கலை** | **3** |
| நடுகல்முதல்நவீனசிற்பங்கள்வரை - ஐம்பொன்சிலைகள் - பழங்குடியினர்மற்றும்அவர்கள்தயாரிக்கும்கைவினைப்பொருட்கள்,பொம்மைகள்-<br>தேர்செய்யும்கலை-சுடுமண்சிற்பங்கள்-நாட்டுப்புறதெய்வங்கள்-<br>குமரிமுனையில்திருவள்ளுவர்சிலை-இசைக்கருவிகள்-ருதங்கம்,பறை,வீணை,யாழ் ,நாதஸ்வரம் -தமிழர்களின்சமூகபொருளாதாரவாழ்வில் கோவில்களின்பங்கு | | |
| **அலகு 3** | **நாட்டுப்புறகலைகள்மற்றும்வீரவிளையாட்டுகள்** | **3** |
| தெருக்கூத்து,கரகாட்டம்,வில்லுப்பாட்டு,கணியான்கூத்து,ஒயிலாட்டம்,தோல்பாவைக்கூத்து, சிலம்பாட்டம்,வளரி,புலியாட்டம்,தமிழர்களின்விளையாட்டுகள் | | |
| **அலகு 4** | **தமிழர்களின்திணைக்கோட்பாடுகள்** | **3** |
| தமிழகத்தின்தாவரங்களும்,விலங்குகளும்-<br>தொல்காப்பியம்மற்றும்சங்கஇலக்கியத்தில்அகம்மற்றும்புறக்கோட்பாடுகள்-<br>தமிழர்கள்போற்றியஅறக்கோட்பாடு-சங்ககாலத்தில்எழுத்தறிவும்,கல்வியும்-<br>சங்ககாலநகரங்களும்,துறைமுகங்களும்-சங்ககாலத்தில்ஏற்றுமதிமற்றும்இறக்குமதி-<br>கடல்கடந்தநாடுகளில்சோழர்களின்வெற்றி | | |
| **அலகு 5** | **இந்தியதேசியஇயக்கம்மற்றும்இந்தியபண்பாட்டிற்குதமிழர்களின் பங்களிப்பு** | **3** |
| இந்தியவிடுதலைப்போரில்தமிழர்களின்பங்கு-<br>இந்தியாவின்பிறபகுதிகளில்தமிழ்ப்பண்பாட்டின்தாக்கம் -சுயமரியாதைஇயக்கம்-<br>இந்தியமருத்துவத்தில்சித்தமருத்துவத்தின்பங்கு -கல்வெட்டுகள் ,கையெழுத்துப்படிகள் -<br>தமிழ்ப்புத்தகங்களின்அச்சுவரலாறு | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **15** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **15** |

| BOOK REFERENCES | |
|---|---|
| 1 | தமிழகவரலாறு –மக்களும்பண்பாடும்கேகேபிள்ளை (வெளியீடு :தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம் ) |
| 2 | கணினித்தமிழ் – முனைவர்.இல.சுந்தரம் (விகடன்பிரசுரம்) |
| 3 | கீழடிவைகைநதிகரையில்சங்ககாலநகரநாகரிகம்தொல்லியல்துறைவெளியீடு |
| 4 | Social Life of Tamils(Dr.K.K.Pillai) A joint publication of TNTB and ESC and RMRL – (in print) |
| 5 | Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) Published by International Institute of Tamil Studies. |
| 6 | The Contribution of the Tamils to Indian Culture ( Dr.M.Valarmathi ) Published by International Institute of Tamil Studies. |

## SEMESTER II

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | 23EN2T1 | Technical English | HS | 40 | 60 | 3 | 0 | 0 | 3 |
| 2 | 23HS2T2 | Environmental Sciences | MC | 100 | 0 | 3 | 0 | 0 | 0 |
| 3 | 23HS2T3 | Tamils And Technology | MC | 100 | 0 | 1 | 0 | 0 | 1 |
| 4 | 23MA2T4 | Algebra and Number Theory | BS | 40 | 60 | 3 | 1 | 0 | 4 |
| **THEORY COURSES WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 5 | 23CS2LT1 | Python Programming | ES | 50 | 50 | 3 | 0 | 4 | 5 |
| 6 | 23EE2LT2 | Basics of Electrical and Electronics Engineering | ES | 50 | 50 | 3 | 0 | 4 | 5 |
| **Total** | | | | | | **16** | **1** | **8** | **18** |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| II | B.E. / B.Tech., Common to all | 23EN2T1 | TECHNICAL ENGLISH | 3 | 0 | 0 | 3 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Learn about personality development to enhance interactions. | K2 | 1 |
| **CO2** | Improve skills by cultivating self-confidence. | K4 | 2 |
| **CO3** | Increase social abilities by mastering communication. | K2 | 3 |
| **CO4** | Reveal true personality for stronger interactions. | K6 | 4 |
| **CO5** | Develop the ability to speak confidently in any situation | K6 | 5 |

| PRE-REQUISITE | COMMUNICATIVE ENGLISH |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO2 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO3 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO4 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO5 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| | 2 | Other Assessments (Assignment, Quiz etc...) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | | **9** |
| **GRAMMAR COMPONENTS:** One Word Substitutes • Homophones • Homonyms • Words often Confused • Pairs of Words<br>**LINGUISTIC FUNCTIONS:** - Paragraph Construction • Dialogue Writing • Introduction to Presentation • Communication • Importance of Communication • Tweets • Texting and SMS language • Note Making | | |
| **Topic - 2** | | **9** |
| **GRAMMAR COMPONENTS:** Error Analysis • Concord • Collocations – Fixed and Semi Fixed Expressions.<br>**LINGUISTIC FUNCTIONS:** Telephoning Skills • Leadership and Team Management • Qualities of a Good Leader • Leadership Styles • Decision Making • Problem Solving • Technical Report Writing | | |
| **Topic - 3** | | **9** |
| **GRAMMAR COMPONENTS:** Direct Indirect Speech • Active Passive Voice • Conditional Sentences<br>**LINGUISTIC FUNCTIONS:** Group Discussions • Purpose (Intellectual "ability, Creativity, Approach to a problem, Solving, Tolerance, Qualities of a leader) • Group Behavior • Analyzing Performance • Reading Comprehension Memo • Notices/Circulars Agenda and Minutes of a Meeting. | | |
| **Topic - 4** | | **9** |
| **GRAMMAR COMPONENTS:** Misspelled words • Spot the errors • Vocabulary Development • Guessing Meanings of Words.<br>**LINGUISTIC FUNCTIONS:** Interviews: Types of Interviews • Preparing Resumes & CV • Covering Letter • Brainstorming. | | |
| **Topic - 5** | | **9** |
| **LINGUISTIC FUNCTIONS:** Mock Presentation • Viewing a model group discussion and reviewing the performance of each participant • Casual Conversation • Participating in a Group Discussion • Speeches for special Occasions. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **45** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **45** |

| BOOK REFERENCES | |
|---|---|
| 1 | Technical English, Paperback – 15 December 2019 by **Prof. Ravindra Nath Tiwari** (Author) |
| 2 | Developing English Language Skills-I: (NEP 2020 for the University of Delhi) by Pooja Khanna |
| 3 | Teaching Communicative English By Dr.N.Badhri Ph.D(Eng.).,Ph.D(Edn.)., 2021. |
| 4 | Communicative English By S. Kannan Padmasani , 2019. |
| 5 | Technical English – II by Prof. Ravindra Nath Tiwari,2020. |
| 6 | Intercultural Pragmatics, Edited by Istvan Kecskes, State University of New York, Albany<br>Publisher: Cambridge University Press, Online publication date: September 2022, Print publication year: 2022, Online ISBN: 9781108884303, DOI: https://doi.org/10.1017/9781108884303 |

| OTHER REFERENCES | |
|---|---|
| 1 | https://youtu.be/RkOb-IjkBbw |
| 2 | https://youtu.be/8SyZWgzLQSo |
| 3 | https://youtu.be/0E9deF06NUU |
| 4 | https://youtu.be/CAU2zx2Ri_M?si=jWLm7ZGegmKwO8Ii |
| 5 | https://youtube.com/playlist?list=PLyViUDdoFYKypuYyhNF2ZC9xEUE8zDmzx&si=uYKTb1eZGCWwDVon |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| II | B.E. / B.Tech., Common to all | 23HS2T2 | ENVIRONMENTAL SCIENCES | 3 | 0 | 0 | 0 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Understand the scientific inquiry in the field of ecosystems for future life. | K2 | 1 |
| **CO2** | Identify the different methods of conservation of biodiversity by analysing the factors that contribute the threat to extinction. | K2 | 2 |
| **CO3** | Enumerate the control plan for environmental pollution problems by identifying and quantifying it's magnitude and intensity | K2 | 3 |
| **CO4** | Understand systematically the natural resources and identify the resource management. | K2 | 4 |
| **CO5** | Solve current environmental problems by practising the adoption of sustainability in society and industry | K2 | 5 |

| PRE-REQUISITE | NIL |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 1 | - | - | 2 | 1 | 2 | 3 | 2 | 3 | 2 | - | 2 | - | - |
| CO2 | 1 | - | - | 2 | - | 2 | 3 | 2 | 3 | 2 | - | 2 | - | - |
| CO3 | 1 | - | - | 2 | - | 2 | 3 | 2 | 3 | 2 | - | 2 | - | - |
| CO4 | 1 | - | - | 2 | - | 2 | 3 | 2 | 3 | 2 | - | 2 | - | - |
| CO5 | 1 | 2 | 2 | 3 | - | 2 | 3 | 2 | 3 | 2 | - | 2 | - | - |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **ENVIRONMENT AND ECOSYSTEMS** | **9 + 3** |
| Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs – Introduction, types, characteristic features, structure and function of the forest ecosystem and aquatic ecosystems (ponds, river and marine).<br>Activity: Study of the ecosystem structure in Cauvery River. | | |
| **Topic - 2** | **BIODIVERSITY** | **9 + 3** |
| Introduction to biodiversity - definition: genetic, species and ecosystem diversity – values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species of India – In-situ and ex- situ conservation of biodiversity.<br>Activity: Study of common plants, insects, birds. | | |
| **Topic - 3** | **ENVIRONMENTAL POLLUTION** | **9 + 3** |
| Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Thermal pollution (d) Noise pollution – solid waste management: causes, effects and control measures of municipal solid wastes – Hazardous and biomedical waste management -pollution case studies.<br>Activity: Study of air and water pollution in industry | | |
| **Topic - 4** | **NATURAL RESOURCES** | **9 + 3** |
| Forest resources: over-exploitation, deforestation, – Water resources: Rain water harvesting - watershed management - utilization of surface and ground water, conflicts over water, dams-benefits and problems Food resources: effects of modern agriculture, fertilizer - pesticide problems - Principles of Green Chemistry- Case studies<br>Activity: Tree plantation and maintenance within the campus | | |
| **Topic - 5** | **SUSTAINABILITY AND POPULATION** | **9 + 3** |
| From unsustainable to sustainable development – Environmental Impact Assessment (EIA) – environmental ethics: Issues and possible solutions – climate change, acid rain, ozone layer depletion, and case studies – Environment Protection Act 1986 – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Environment and Human Health – Value Education – HIV / AIDS – Women and Child Welfare.<br>Activity: Small group meetings about environment and human health in local area peoples and making poster and short films about HIV / AIDS – women and child welfare. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **45** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **45** |

| BOOK REFERENCES | |
|---|---|
| 1 | Erach Bharucha, “Environmental Studies for Undergraduate Courses”, Third Edition, Orient Blackswan Pvt Ltd (8 March 2021). |
| 2 | Rajagopalan, R, ‘Environmental Studies-From Crisis to Cure’, Oxford University Press, 2015. |
| 3 | Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill Education, New Delhi, 2017. |
| 4 | e-book:https://www.iisd.org/system/files/2021-04/still-one-earth-natural-resources.pdf |
| 5 | -book: https://www.researchgate.net/publication/11065962_Population_growth_rate_and_its_ determinants_ An_ overview |
| 6 | e-book :https://northinlet.sc.edu/wp-content/uploads/2022/03/Biodiversity-book.pdf |

| OTHER REFERENCES | |
|---|---|
| 1 | https://www.youtube.com/watch?v=LjFt7rlCU84&t=6s |
| 2 | https://archive.nptel.ac.in/courses/120/108/120108004/ |
| 3 | https://archive.nptel.ac.in/courses/120/108/120108002/ |
| 4 | https://archive.nptel.ac.in/courses/103/107/103107215/ |
| 5 | https://archive.nptel.ac.in/courses/127/106/127106004/ |
| 6 | https://archive.nptel.ac.in/courses/123/105/123105001/ |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| II | B.E.,CSE & B.TECH IT & AIDS | 23MA2T4 | ALGEBRA AND NUMBER THEORY | 3 | 1 | 0 | 4 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Understand the fundamental concepts of vector algebra and their role in modern mathematics. | K2 | 1 |
| **CO2** | Apply orthogonalization method to solve the problems on linear transformation. | K3 | 2 |
| **CO3** | Determine the accurate and efficient use of advanced algebraic techniques. | K2 | 3 |
| **CO4** | Use Chinese remainder theorem to solve a system two or more simultaneous linear congruences. | K3 | 4 |
| **CO5** | Apply classical theorems to solve multiplicative functions. | K3 | 5 |

| PRE-REQUISITE | CALCULUS AND DIFFERENTIAL EQUATIONS |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO2 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO3 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO4 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO5 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| | 2 | Other Assessments (Assignment, Quiz etc.) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **VECTOR SPACES** | **9 + 3** |
| Vector spaces-Subspaces-Linear combinations and linear system of equations-Linear dependence and independence-Bases and dimensions | | |
| **Topic - 2** | **LINEAR TRANSFORMATION AND INNER PRODUCT SPACES** | **9 + 3** |
| Linear transformation-Null spaces and ranges-Dimension theorem-Matrix representation of a linear transformation-Inner product-Norms-Gram Schimdt orthogonalization process | | |
| **Topic - 3** | **DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS** | **9 + 3** |
| Division algorithm – Base - b representations – Number patterns – Prime and composite numbers – GCD– Euclidean algorithm – Fundamental theorem of arithmetic – LCM | | |
| **Topic - 4** | **DIOPHANTINE EQUATIONS AND CONGRUENCES** | **9 + 3** |
| Linear Diophantine equations – Congruence‘s – Linear Congruence‘s - Applications: divisibility tests - Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems. | | |
| **Topic - 5** | **CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS** | **9 + 3** |
| Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phi functions – Tau and Sigma functions. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **45** | | **TUTORIAL** | **15** | | **PRACTICAL** | **0** | | **TOTAL** | **60** |

| BOOK REFERENCES | |
|---|---|
| 1 | Ramana B.V., “Higher Engineering Mathematics”, Tata Mcgraw Hill Publishing Company, New Delhi, 2008. |
| 2 | “Algebraic Number Theory”, Second Edition, Richard A.Mollin, 2011.(E-Book) |
| 3 | J.H.van Lint, “Introduction to Coding Theory”, Third Edition, Springer. |
| 4 | David M,Burton, “Elementary Number Theory”, Sixth Edition, Tata Mcgraw Hill, 2011. |
| 5 | Martin Erickson & Anthony Vazzana, “Introduction to Number Theory”, Chapman & Hall/CRC, 2007. |
| 6 | “Algebraic Number Theory”, J.S. Milne, Version 3.08 July 19, 2020.(E-Book) |

| OTHER REFERENCES | |
|---|---|
| **1** | **https://youtu.be/Qm_OS-8COwU** |
| **2** | **https://youtu.be/KOkuTXrv5Gg** |
| **3** | **https://youtu.be/ru7mWZJlRQg** |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| II | **B.E. / B.Tech., Common to all** | 23HS2T6 | **TAMILS AND TECHNOLOGY** | 1 | 0 | 0 | 1 |

| **COURSE LEARNING OUTCOMES (COs)** | | | |
|---|---|---|---|
| **After Successful completion of the course, the students should be able to** | | **RBT Level** | **Topics Covered** |
| **CO1** | Understand the weaving ceramic technology of ancient Tamil people nature. | K2 | 1 |
| **CO2** | Understand the construction technology, building materials in Sangam period and case studies. | K2 | 2 |
| **CO3** | Infer the metal process, coin and beads manufacturing with relevant archeological evidence. | K2 | 3 |
| **CO4** | Realize the agriculture methods, irrigation technology and pearl driving. | K2 | 4 |
| **CO5** | Understand the knowledge of scientific tamil and tamil computing. | K2 | 5 |

| **PRE-REQUISITE** | **Heritage of Tamils** |
|---|---|

| **CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **Programme Learning Outcomes (POs)** | | | | | | | | | | | | **PSOs** | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO2 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO3 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO4 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO5 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |

| **COURSE ASSESSMENT METHODS** | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **WEAVING AND CERAMIC TECHNOLOGY** | **3** |
| Weaving Industry during Sangam Age-Ceramic technology-Black and Red Ware Potteries(BRW)-Graffiti on Potteries | | |
| **Topic - 2** | **DESIGN AND CONSTRUCTION TECHNOLOGY** | **3** |
| 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 Mamallapuram-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 | | |
| **Topic - 3** | **MANUFACTURING TECHNOLOGY** | **3** |
| Art of Ship Building-Metallurgical studies-Iron industry- Iron smelting steel- Copper and gold-Coins are source of history- Minting of Coins-Beads making- industries Stone beads- Glass beads- Terracotta beads-Shell beats/bone beats- Archeological evidences-Gem stone types described in Silapathigaram | | |
| **Topic - 4** | **AGRICULTURE AND IRRIGATION TECHNOLOGY** | **3** |
| Dam ,Tank, ponds, sluice, Significance of Kumizhi Thoompu 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 | | |
| **Topic - 5** | **SCIENTIFIC TAMIL & TAMIL COMPUTING** | **3** |
| 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 | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **15** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **15** |

| BOOK REFERENCES | |
|---|---|
| 1 | தமிழக வரலாறு –மக்களும் பண்பாடும் கேகே பிள்ளை (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம் ) |
| 2 | கணினித் தமிழ் – முனைவர். இல. சுந்தரம் (விகடன் பிரசுரம்) |
| 3 | கீழடி வைகை நதி கரையில் சங்க கால நகர நாகரிகம் தொல்லியல் துறை வெளியீடு |
| 4 | Social Life of Tamils(Dr.K.K.Pillai) A joint publication of TNTB and ESC and RMRL – (in print) |
| 5 | Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) Published by International Institute of Tamil Studies. |
| 6 | The Contribution of the Tamils to Indian Culture ( Dr.M.Valarmathi ) Published by International Institute of Tamil Studies. |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| II | B.E. / B.Tech., Common to all | 23HS2T6 | தமிழரும் தொழில்நுட்பமும் | 1 | 0 | 0 | 1 |

| பாடம் கற்றதின் விளைவுகள் | | | |
|---|---|---|---|
| **After Successful completion of the course, the students should be able to** | | **RBT Level** | **Topics Covered** |
| **CO1** | சங்ககாலத் தமிழர்களின் நெசவு மற்றும் பானை வனைதல் தொழில்நுட்பம் குறித்த கற்றுணர்தல். | K2 | 1 |
| **CO2** | சங்ககாலத் தமிழர்களின் கட்டட தொழில்நுட்பம், கட்டுமான பொருட்கள் மற்றும் அவற்றை விளக்கும் தளங்கள் குறித்து புரிதல். | K2 | 2 |
| **CO3** | சங்ககாலத் தமிழர்களின் உலோகத்தொழில் ,நாணயங்கள் மற்றும் மணிகள் சார்ந்த தொல்லியல் சான்றுகள் பற்றி அறிதல். | K2 | 3 |
| **CO4** | சங்ககாலத் தமிழர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள் மற்றும் முத்து குளித்தல் பற்றி புரிதல். | K2 | 4 |
| **CO5** | நவீன அறிவியல் தமிழ் மற்றும் கணித்தமிழ் குறித்து புரிந்து கொள்ளலும் மற்றும் பயன்படுத்துதலும் . | K2 | 5 |

| **PRE-REQUISITE** | தமிழர் மரபு |
|---|---|

| **CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **Programme Learning Outcomes (POs)** | | | | | | | | | | | | **PSOs** | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO2 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO3 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO4 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |
| CO5 | - | - | - | - | - | - | 3 | 3 | - | 2 | - | 3 | - | - |

| **COURSE ASSESSMENT METHODS** | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| **INDIRECT** | 1 | Course Exit Survey |

| பாடத்திட்டங்கள் | | |
|---|---|---|
| **அலகு 1** | **நெசவு மற்றும் பானைத் தொழில்நுட்பம்** | **3** |
| சங்ககாலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள்- பாண்டங்களில் கீறல் குறியீடுகள். | | |
| **அலகு 2** | **வடிவமைப்பு மற்றும் கட்டிட தொழில்நுட்பம்** | **3** |
| சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் மற்றும் சங்ககாலத்தில் வீட்டு பொருட்களின் வடிவமைப்பு -சங்க காலத்தில் கட்டுமான பொருட்களும் நடுக்கல்லும் சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் -மாமல்லபுர சிற்பங்களும் கோவில்களும் -சோழர் காலத்து பெருங் கோயில்கள் மற்றும் பிற வழிபாட்டுத்தலங்கள் - நாயக்கர் கால கோயில்கள்- மாதிரி கட்டமைப்புகள் பற்றி அறிதல் - மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் -செட்டிநாடு வீடுகள்- பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ சாரோ செமி கட்டிடக்கலை<br>. | | |
| **அலகு 3** | **உற்பத்தித் தொழில்நுட்பம்** | **3** |
| கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருகுதல், எக்கு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள் - கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள்- எலும்புத் துண்டுகள்- தொல்லியல் சான்றுகள் -சிலப்பதிகாரத்தில் மணிகளின் வகைகள். | | |
| **அலகு 4** | **வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்** | **3** |
| அணை, ஏரி, குளங்கள் ,மதகு - சோழர் காலக் குமிழித்தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம். | | |
| **அலகு 5** | **அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்** | **3** |
| அறிவியல் தமிழின் வளர்ச்சி - கணினித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணைய கல்விக் கழகம் - தமிழ் மின்நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத்திட்டம். | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **15** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **15** |

| BOOK REFERENCES | |
|---|---|
| 1 | தமிழக வரலாறு –மக்களும் பண்பாடும் கேகே பிள்ளை (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம் ) |
| 2 | கணினித் தமிழ் – முனைவர். இல. சுந்தரம் (விகடன் பிரசுரம்) |
| 3 | கீழடி வைகை நதி கரையில் சங்க கால நகர நாகரிகம் தொல்லியல் துறை வெளியீடு |
| 4 | Social Life of Tamils(Dr.K.K.Pillai) A joint publication of TNTB and ESC and RMRL – (in print) |
| 5 | Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) Published by International Institute of Tamil Studies. |
| 6 | The Contribution of the Tamils to Indian Culture ( Dr.M.Valarmathi ) Published by International Institute of Tamil Studies. |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| II | B.E. CSE & B.TECH. IT | 23CS2LT1 | PYHTON PROGRAMMING | 3 | 0 | 4 | 5 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| **After Successful completion of the course, the students should be able to** | | **RBT Level** | **Topics Covered** |
| **CO1** | Understand the basics of Python Programming constructs. | K2 | 1 |
| **CO2** | Explain the implementation of all strings functions. | K2 | 2 |
| **CO3** | Apply most appropriate programming constructs and features to solve the problems with list, tuples and dictionaries. | K3 | 3 |
| **CO4** | Explain the programming skills for the use of the logical constructs of language using function and files. | K2 | 4 |
| **CO5** | Demonstrate significant experience with the Python program development environment. | K2 | 5 |

| **PRE-REQUISITE** | **NIL** |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **Programme Learning Outcomes (POs)** | | | | | | | | | | | | **PSOs** | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 3 | - | - | - | 2 | 2 | 3 | 3 | 2 | 3 | - | - |
| CO2 | 1 | 2 | 3 | 2 | 2 | - | 2 | 2 | 3 | 3 | - | 3 | - | 2 |
| CO3 | 3 | 2 | 2 | - | - | - | 2 | 2 | 3 | 3 | 2 | 3 | - | 2 |
| CO4 | 1 | 3 | 2 | 2 | - | - | 2 | 2 | 3 | 3 | - | 3 | 2 | - |
| CO5 | 3 | 2 | - | - | - | - | 2 | 2 | 3 | 3 | 3 | 3 | - | 2 |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **INTRODUCTION TO PYTHON** | **9** |
| Introduction to python: Features - Execution of python program – Flavors of Python – Comments - Data Types: Built-in data types– Sequences – Set - Literals– Operators – Input and Output Statements - Control Statements : if – if-else –if-else-if – while-For –Nested loops – the else suite - Break – Continue - pass - assert – return. | | |
| **Topic - 2** | **STRINGS** | **9** |
| Strings and Characters: Creating – Length – Indexing – Slicing – Repeating – Concatenation – Comparing - Removing Spaces - Finding Sub Strings - Counting Substrings in a String - Strings are Immutable - Replacing a String with another String - Splitting and Joining Strings - Changing Case of a String - Checking Starting and Ending of a String - Formatting the Strings. | | |
| **Topic - 3** | **LISTS , TUPLES AND DICTIONARIES** | **9** |
| Lists: Creating Lists – Updating - Concatenation - Repetition - Methods – Sorting. Tuples: Creating - Accessing – Operations – Functions - Nested Tuples - Inserting Elements, Modifying Elements, Deleting Elements from a tuples. Dictionaries: Operations – Methods - Using for Loop with Dictionaries – Sorting the Elements of a Dictionary using Lambdas. | | |
| **Topic - 4** | **ARRAYS ,FUNCTIONS AND FILES** | **9** |
| Arrays: One Dimensional arrays - Multi Dimensional arrays - Functions: Defining – Calling – Returning - Pass by Object Reference – Formal, Actual, Positional, Keyword, Default & Variable Length Arguments - Local and Global Variables - Recursive Functions - Lambdas - Function Decorators. Files - Types of Files - Opening & Closing a File - Working with Text Files Containing Strings - Working with Binary Files. | | |
| **Topic - 5** | **MODULES AND FRAMEWORKS** | **9** |
| Modules: Importing module –Features – Built in functions. - Python Environment and Frameworks: NumPy: NumPy Arrays – Computation on NumPy Arrays – Aggregation – Sorting Arrays – Structured Arrays. | | |

| **THEORY** | **45** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **45** |
|---|---|---|---|---|---|---|---|---|---|---|

| COURSE CONTENT | |
|---|---|
| **Experiment-1** | Programs for demonstrating the use of different types of operators. |
| **Experiment-2** | Programs for demonstrating control statements. |
| **Experiment-3** | Programs to implement various string operations. |
| **Experiment-4** | Programs for demonstrating the following i. Lists ii. Tuples iii. Dictionaries. |
| **Experiment-5** | Programs to demonstrate concepts using functions. |
| **Experiment-6** | Implement user defined functions using python. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Experiment-7** | Programs to implement applications using File handling. | | | | | | | | | |
| **Experiment-8** | Programs to demonstrate modules. | | | | | | | | | |
| **Experiment-9** | Create programs to solve problems using various data structures in python. | | | | | | | | | |
| **Experiment-10** | Perform data manipulation using NumPy. | | | | | | | | | |
| **THEORY** | **0** | | **TUTORIAL** | **0** | | **PRACTICAL** | **60** | | **TOTAL** | **60** |

| **BOOK REFERENCES** | |
|---|---|
| 1 | Dr. R. Nageswara Rao, "Core Python Programming", Dreamtech Press, 2021 Edition. |
| 2 | Jake Vander Plas, —"Python Data Science Handbook Essential Tools for Working with Datal", 1st Edition O'Reilly Publishers, 2016 for Unit V. |
| 3 | Head-First Python, 2nd Edition, Paul Barry (O'Reily, 2016) |

| **OTHER REFERENCES** | |
|---|---|
| 1 | Kenneth A. Lambert, "Fundamentals of Python: First Programs", Cengage Learning, 2018. |
| 2 | Wesley J. Chun, "Core Python Programming", Pearson Education, 2013. |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| II | B.E. CSE, B.Tech IT, B.Tech AI&DS | 23EE2LT2 | BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING | 3 | 0 | 4 | 5 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Apply the knowledge of basic circuital laws; analyze the DC and AC circuits using mesh and nodal analysis. | K3 | 1 |
| **CO2** | Illustrate the knowledge in constructional details and working principles of DC and AC machines. | K2 | 2 |
| **CO3** | Analyze the characteristics of different electronic devices such as Diodes and Transistors. | K4 | 3 |
| **CO4** | Demonstrate the various number systems and simplify the logical expressions using Boolean functions. | K2 | 4 |
| **CO5** | Build the concepts of Fundamentals of Electrical and Electronic Instruments. | K3 | 5 |

| PRE-REQUISITE | NIL |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | | | | | | | | | 3 | 3 | 1 |
| CO2 | 3 | 2 | 2 | | | | | | | | | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | | | | | | | | | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | | | | | | | | | 2 | 2 | 0 |
| CO5 | 3 | 2 | 2 | | | | | | | | | 3 | 2 | 1 |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **ELECTRICAL CIRCUITS** | **9** |
| DC Circuits: Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Nodal Analysis, Mesh analysis with Independent sources only (Steady state)<br>AC Circuits: Waveforms – Average and RMS Value - Power and Power factor – Single and Three Phase Balanced Circuits. | | |
| **Topic - 2** | **ELECTRICAL MACHINES** | **9** |
| Construction, Working Principle and Applications of DC Generators, DC Motors, Single Phase Transformer, Single Phase Induction Motor. | | |
| **Topic - 3** | **ANALOG ELECTRONICS** | **9** |
| Introduction - Characteristics of PN Junction Diode and Zener Diode – Half wave and Full wave Rectifiers –Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics. | | |
| **Topic - 4** | **DIGITAL ELECTRONICS** | **9** |
| Binary Number System – Boolean Algebra theorems– Digital circuits - Introduction to sequential Circuits– Flip-Flops – Registers and Counters – A/D and D/A Conversion. | | |
| **Topic - 5** | **MEASUREMENTS AND INSTRUMENTATION** | **9** |
| Functional elements of an instrument - Standards and Calibration - Operating Principle of Moving Coil and Moving Iron meters - Energy Meter - CT and PT - DSO - Data acquisition. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **45** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **45** |

| LIST OF EXPERIMENTS | |
|---|---|
| **Experiment-1** | Experimental verification of Ohm's law. |
| **Experiment-2** | Experimental verification of Kirchhoff's Voltage and Current laws. |
| **Experiment-3** | Open circuit and Load characteristics of DC Shunt generator. |
| **Experiment-4** | Load test on DC Shunt motor. |
| **Experiment-5** | Load test on DC Series motor. |
| **Experiment-6** | Open circuit and Short circuit tests on single phase transformer. |
| **Experiment-7** | Load test on single-phase induction motor. |
| **Experiment-8** | Characteristics of Semi conductor diode and Zener diode. |
| **Experiment-9** | Measurement of ripple factor in Half wave and full wave rectifiers. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Experiment-10** | Characteristics of a NPN Transistor under CE, CC and CB configurations. | | | | | | | | | |
| **Experiment-11** | Study of logic gates AND, OR, NOT and EX-OR gates. | | | | | | | | | |
| **Experiment-12** | Implementation of Boolean Functions, Adder/ Subtractor circuits. | | | | | | | | | |
| **Experiment-13** | Measurement of energy using single phase energy meter. | | | | | | | | | |
| **Experiment-14** | Study of DC and AC motor starters. | | | | | | | | | |
| **THEORY** | **0** | | **TUTORIAL** | **0** | | **PRACTICAL** | **60** | | **TOTAL** | **60** |

| **BOOK REFERENCES** | |
|---|---|
| 1 | Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi, 2001. |
| 2 | D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 2002. |
| 3 | Balbir Kumar, Shail.B.Jain, "Electronic Devices and Circuits" PHI learning private limited, 2nd edition 2014. |
| 4 | M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013. |
| 5 | A.K.Shawney, "A Course in Electrical and Electronics Measurements & Instrumentation", Dhanpat Rai & Co. 2020. |

| **OTHER REFERENCES** | |
|---|---|
| 1 | https://youtu.be/-F7UJxGpkqw?si=q4k_ThrcTOCl5yj3 |
| 2 | https://youtu.be/KwctEJaYers?si=4lOCFtNiWjLBy2FA |
| 3 | https://youtu.be/EdUAecpYVWQ?si=tWhNn-0Hb2srXtuN |
| 4 | https://youtu.be/2xXErGeeb_Q?si=vwd_nhujjo7Wt1Va |
| 5 | https://youtu.be/HY39LA6H-Lo?si=n38kcYulidSmIbM9 |

## SEMESTER III

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | 23HS3T1 | Constitution of India | MC | 100 | - | 3 | 0 | 0 | 0 |
| 2 | 23MA3T2 | Probability and Queuing Theory | BS | 40 | 60 | 3 | 1 | 0 | 4 |
| 3 | 23EC3T4 | Digital Principles and System Design | ES | 40 | 60 | 3 | 0 | 0 | 3 |
| 4 | 23CS3T3 | User Interface Design | PC | 40 | 60 | 3 | 1 | 0 | 4 |
| **THEORY COURSES WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 5 | 23CS3LT1 | Object Oriented Programming with Java | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| 6 | 23CS3LT2 | Data Structures & Algorithms | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| **LABORATORY COMPONENTS** | | | | | | | | | |
| 7 | 23EN3L1 | Inter Personal Communication Skills Laboratory – I | HS | 60 | 40 | 0 | 0 | 3 | 1.5 |
| **Total** | | | | | | **16** | **2** | **11** | **20.5** |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| III | B.E. CSE & B.Tech. IT | 23HS3T1 | **CONSTITUTION OF INDIA** | 3 | 0 | 0 | 0 |

| **COURSE LEARNING OUTCOMES (COs)** | | | |
|---|---|---|---|
| **After Successful completion of the course, the students should be able to** | | **RBT Level** | **Topics Covered** |
| **CO1** | Understand and abide the rules of the Indian constitution. | K2 | 1 |
| **CO2** | Understand the functions of Central government. | K2 | 2 |
| **CO3** | Understand the function of state government. | K2 | 3 |
| **CO4** | Understand the various constitutional functions and laws. | K2 | 4 |
| **CO5** | Understand the different culture among the people of India | K2 | 5 |

| **PRE-REQUISITE** | **NIL** |
|---|---|

| **CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **Programme Learning Outcomes (POs)** | | | | | | | | | | | | **PSOs** | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | 2 | 2 | 2 | 3 | 3 | | 3 | | 1 |
| CO2 | | | | | | 1 | 2 | 2 | 3 | 3 | | 3 | | 1 |
| CO3 | | | | | | 1 | 2 | 2 | 3 | 3 | | 3 | | 1 |
| CO4 | | | | | | 1 | 2 | 2 | 3 | 3 | | 3 | | 1 |
| CO5 | | | | | | 1 | 2 | 2 | 3 | 3 | | 3 | | 1 |

| **COURSE ASSESSMENT METHODS** | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **INTRODUCTION** | **9** |

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Role of the Election Commission.

| **Topic - 2** | **STRUCTURE AND FUNCTION OF CENTRAL AND STATE GOVERNMENT** | **9** |
|---|---|---|

Union Government – Structures of the Union Government and Functions – President – Vice President– Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review. State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

| **Topic - 3** | **CONSTITUTION FUNCTIONS OF INDIA AND INDIAN SOCIETY** | **9** |
|---|---|---|

Indian Federal System – Central – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India. Society : 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

| **Topic - 4** | **POLICIES AND ACTS – GENERAL** | **9** |
|---|---|---|

Insurance and Bonding – Laws Governing Sale, Purchase and use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax , Excise and Custom duties and their Influence on Construction Cost – Legal Requirements for Planning – Property Law– Agency Law – Local Government Laws for Approval.

| **Topic - 5** | **POLICIES AND ACTS ON INFRASTRUCTURE DEVELOPMENT** | **9** |
|---|---|---|

A Historical Review of the Government Policies on Infrastructure – Current Public Policies on Transportations – Power and telecom Sector – Plans for Infrastructure Development – Legal framework for Regulating Private Participation in Roads and Highways – Ports and Airport and Telecom.

| **THEORY** | **45** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **45** |
|---|---|---|---|---|---|---|---|---|---|---|

| **BOOK REFERENCES** | |
|---|---|
| 1 | Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi,2018. |
| 2 | R.C.Agarwal, "Indian Political System", S.Chand and Company, New Delhi, 2004 |
| 3 | Maciver and Page, "Society: An Introduction Analysis", Mac Milan India Ltd., New Delhi,2007 |
| 4 | K.L.Sharma, "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi,2006. |

| **OTHER REFERENCES** | |
|---|---|
| 1 | https://nptel.ac.in/courses/106/105/106105034/ |
| 2 | https://www.youtube.com/watch?v=6XTYoZymbwE |
| 3 | https://www.youtube.com/watch?v=MP6VlAE_7WY |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| III | B.E.CSE & B.Tech. IT | 23MA3T2 | PROBABILITY AND QUEUEING THEORY | 3 | 1 | 0 | 4 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Relate and apply the concept of probability and random variables and predict probabilities of events in models following normal distribution. | K2 | 1 |
| **CO2** | Interpret discrete and continuous probability distributions including requirements, mean and variance for making decisions | K2 | 2 |
| **CO3** | Compute correlation between variables, and predict unknown values using regression. | K3 | 3 |
| **CO4** | Classify different types of random processes and use it to find whether it is SSS or WSS. | K2 | 4 |
| **CO5** | Analyse the situation and select an appropriate queuing model techniques for solving problems based on Little's formula. | K4 | 5 |

| | |
|---|---|
| **PRE-REQUISITE** | CALCULUS AND DIFFERENTIAL EQUATIONS, ALGEBRA AND NUMBER THEORY |

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO2 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO3 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO4 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |
| CO5 | 3 | 3 | 3 | 3 | - | - | - | 1 | 3 | 2 | - | 2 | - | - |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| | 2 | Other Assessments (Assignment, Quiz etc.) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **PROBABILITY** | **9 + 3** |
| Probability-Axioms of probability –Conditional probability-Total probability-Baye's theorem- Discrete and continuous random variables – Moments – Moment generating functions | | |
| **Topic - 2** | **DISTRIBUTION FUNCTIONS** | **9 + 3** |
| Binomial distribution-Poisson distribution-Exponential distribution-Uniform distribution-Normal distribution-Applications. | | |
| **Topic - 3** | **TWO-DIMENSIONAL RANDOM VARIABLES** | **9 + 3** |
| Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression. | | |
| **Topic - 4** | **RANDOM PROCESSES** | **9 + 3** |
| Classification – Stationary process – Markov chain – Bernoulli and Poisson process. | | |
| **Topic - 5** | **QUEUEING MODELS** | **9 + 3** |
| Markovian queues – Birth and death processes – Single and multiple server queueing models – Little's formula with finite waiting rooms. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **45** | | **TUTORIAL** | **15** | | **PRACTICAL** | **0** | | **TOTAL** | **60** |

| **BOOK REFERENCES** | |
|---|---|
| 1 | Miller. S.L. and Childers. D.G., —"Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2013. |
| 2 | Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2011. |
| 3 | Oliver . C. Lbe., "Fundamentals of applied probability and random processes" Academic Press, 2007. |
| 4 | Taha, H.A., "Operations Research", 8th Edition, Pearson India Education Services, Delhi, 2009. |
| 5 | Donald Gross, John F. Shortle, James M .Thomson, Carl M. Haris.,"Fundamentals of Queueing theory",4th Edition, Wiley India Pvt Ltd,2013. |
| 6 | "Probability, Statistics", and "Queueing Theory Computer Science Applications",<br>Second Edition, ARNOLD O. ALLEN. |

| **OTHER REFERENCES** | |
|---|---|
| 1 | https://youtu.be/InVTlLPF2e8 |
| 2 | https://youtu.be/8963i2DnFiQ |
| 3 | https://youtu.be/HfAXKnibhKw |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| III | B.E. / B.Tech., CSE / IT | 23CS3T3 | DIGITAL PRINCIPLES AND SYSTEM DESIGN | 3 | 0 | 0 | 3 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Demonstrate and understand the basic concepts of digital systems | K3 | 1 |
| **CO2** | Apply and verify the Boolean expression for combinational circuits. | K3 | 2 |
| **CO3** | Apply and verify the Boolean expression for sequential circuits | K3 | 3 |
| **CO4** | Design and verify the asynchronous sequential circuits. | K6 | 4 |
| **CO5** | Describe various programmable logic devices. | K2 | 5 |

| PRE-REQUISITE | NIL |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | | 2 | 2 | | | 2 | | 2 | | | | |
| CO2 | 3 | | 2 | | | | 2 | 2 | | | | | | |
| CO3 | 3 | 2 | | | 2 | | | | 2 | | | | 2 | |
| CO4 | 3 | 2 | | | | 2 | | | | | | | | |
| CO5 | 3 | 2 | 2 | 2 | | | | 2 | | | | | | |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| | 2 | Assignment |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course End Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **BASIC CONCEPTS OF DIGITAL SYSTEMS** | **9** |
| Review of Number systems, Number Representation, Binary Arithmetic and Logic gates, Boolean algebra, Boolean postulates and laws - De-Morgan's Theorem - Principle of Duality, Simplification using Boolean algebra, Canonical forms - Sum of product and Product of sum - Minimization using Karnaugh map and Tabulation method. | | |
| **Topic - 2** | **COMBINATIONAL CIRCUITS** | **9** |
| Realization of combinational logic using gates , Design of combinational circuits : Adder , Subtractor, Parallel adder / Subtractor,,Magnitude Comparator, Parity generator and checker, Encoder, Decoder, Multiplexer, Demultiplexer - Function realization using Multiplexer, Decoder - Codeconverters. | | |
| **Topic - 3** | **SYNCHRONOUS SEQUENTIAL CIRCUITS** | **9** |
| Flip-flops - SR, JK, D and T- Master-Slave – Triggering - Analysis of clocked sequential circuits - State reduction and assignment - Excitation table – Design procedure - Shift registers - Synchronous counters – Ring counter. | | |
| **Topic - 4** | **ASYNCHRONOUS SEQUENTIAL CIRCUITS** | **9** |
| Algorithmic State Machines (ASM) - Asynchronous sequential logic - Analysis procedure – Circuits with latches – Design procedure – Reduction of State and Flow tables – Race free state assignments – Hazards. | | |
| **Topic - 5** | **LOGIC FAMILIES AND PROGRAMMABLE DEVICES** | **9** |
| Introduction to Logic families – ECL, TTL &CMOS - Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Implementation of combinational logic circuits using PLA, PAL. | | |

| **THEORY** | **45** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **45** |
|---|---|---|---|---|---|---|---|---|---|---|

| **BOOK REFERENCES** | |
|---|---|
| 1 | M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 4th Edition, 2016. |
| 2 | Donald D.Givone, "Digital Principles and Design", Tata Mc-Graw Hill Publishing company limited, New Delhi, 2003. |
| 3 | Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education, NewDelhi, 2009. |
| 4 | Leach D, Malvino A P & Saha, "Digital Principles and Applications" 8th Edition, Tata McGrawHill Publishing Company, 2014. |
| 5 | John.M Yarbrough, "Digital Logic Applications and Design", Thomson – Vikas Publishing House, New Delhi, 2002. |

| OTHER REFERENCES | |
|---|---|
| 1 | https://www.youtube.com/watch?v=aWp8ILQgudI |
| 2 | https://www.youtube.com/watch?v=_yHo2qq82P0 |
| 3 | https://www.youtube.com/watch?v=Mt3AToASuFo |
| 4 | https://www.youtube.com/watch?v=L80k-alK58g |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| III | B.E. CSE & B.Tech. IT | 23CS3T3 | **USER INTERFACE DESIGN** | 3 | 1 | 0 | 4 |

| **COURSE LEARNING OUTCOMES (COs)** | | | |
|---|---|---|---|
| **After Successful completion of the course, the students should be able to** | | **RBT Level** | **Topics Covered** |
| **CO1** | Understand the importance of user interface and benefits of good design. | K2 | 1 |
| **CO2** | Develop an effective user interface considering human characteristics, interaction speeds and business functions in relevance to design standards and guidelines | K3 | 2 |
| **CO3** | Develop system menus, navigation schemes, windows, buttons, text boxes, selection controls and presentation controls for a user interface. | K3 | 3 |
| **CO4** | Demonstrate the use of multimedia system components in creating text, graphics, icons, images and video for web pages. | K2 | 4 |
| **CO5** | Develop test cases and evaluate the working system of windows layout for a mobile user interface. | K3 | 5 |

| **PRE-REQUISITE** | **OBJECT ORIENTED PROGRAMMING WITH JAVA** |
|---|---|

| **CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **Programme Learning Outcomes (POs)** | | | | | | | | | | | | **PSOs** | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 2 | - | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 2 | - | 2 | - | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 2 |
| CO3 | 3 | - | 3 | - | 3 | - | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 |
| CO4 | 3 | 3 | | - | - | - | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 2 | 2 | - | - | - | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 |

| **COURSE ASSESSMENT METHODS** | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| | 2 | Other Assessments (Assignment, Quiz etc.) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **INTRODUCTION TO USER INTERFACE** | **9+3** |
| Defining the User Interface – Importance and Benefits of Good Design - Graphical User Interface – Direct Manipulation - Characteristics of Graphical User Interface- Characteristics of Web User Interface Principles of User Interface Design. | | |
| **Topic - 2** | **HUMAN COMPUTER INTERACTION** | **9+3** |
| Human Characteristics in Design-Human Considerations in Design-Human Interaction Speeds. Business Functions: Business Definition and Requirement Analysis-Determining Basic Business Functions-Design Standards or Style Guides | | |
| **Topic - 3** | **NAVIGATION AND LAYOUT** | **9+3** |
| Getting Around: Navigation, Signposts, and Way finding: Signposts- Way finding- Navigation Types – Design Considerations –Navigational Models – Patterns. Layout of Screen Elements: Basics of Layout – Patterns. | | |
| **Topic - 4** | **VISUAL STYLE AND MOBILE INTERFACES** | **9+3** |
| Visual Style and Aesthetics: Basics of Visual Design – Visual Design for Enterprise Applications – Range of Visual Styles. Mobile Interfaces: Challenges and Opportunities of Mobile Design – Approach to Mobile Design – Patterns | | |
| **Topic - 5** | **ACTIONS AND COMMANDS - FORMS AND CONTROLS** | **9+3** |
| Actions and Commands:Tap, Swipe, and Pinch -Rotate and Shake -Buttons -Menu Bars - Menus – Toolbars - Links- Action Panels - Hover Tools - Keyboard Actions- Drag-and-Drop -Typed Commands-Affordance-Direct Manipulation. | | |

| **THEORY** | **45** | | **TUTORIAL** | **15** | | **PRACTICAL** | **0** | | **TOTAL** | **60** |
|---|---|---|---|---|---|---|---|---|---|---|

| **BOOK REFERENCES** | |
|---|---|
| 1 | Wilbert O. Galitz , “The Essential Guide to User Interface Design - An Introduction to GUI Design Principles and Techniques”, Second Edition, John Wiley & Sons, Inc.,2018. |
| 2 | Soren Lauesen, “User Interface Design: A Software Engineering Perspective”, Pearson/AddisonWesley, 2005. |
| 3 | Alan Cooper, “The Essential Of User Interface Design”, Wiley – Dream Tech Ltd.,2002 |
| 4 | Avram Joel Spolsky, “User Interface Design for Programmers”, Apress, 2001 |

| **OTHER REFERENCES** | |
|---|---|
| 1 | https://en.wikipedia.org/wiki/User_interface_design |
| 2 | https://www.tutorialspoint.com/software_engineering/software_user_interface_design.htm |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| III | B.Tech IT , B.Tech AI&DS, B.E(CSE) | 23CS3LT1 | OBJECT ORIENTED PROGRAMMING WITH JAVA | 2 | 0 | 4 | 4 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Explain the object-oriented programming concepts, and apply them in solving problems | K2 | 1 |
| **CO2** | Determine the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes. | K3 | 2 |
| **CO3** | Illustrate the implementation of packages and interfaces | K3 | 3 |
| **CO4** | Infer the concepts of exception handling and multithreading. | K4 | 4 |
| **CO5** | Outline the design of Graphical User Interface using applets and swing controls. | K4 | 5 |

| PRE-REQUISITE | |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO 1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 2 | | | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 |
| CO2 | | | 2 | | | 3 | 2 | 3 | 3 | 3 | 3 | 3 | | 3 |
| CO3 | | 2 | | | | 3 | 2 | 3 | 3 | 3 | 3 | 3 | | |
| CO4 | 3 | 3 | | | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 |
| CO5 | | | 2 | | | 3 | 2 | 3 | 3 | 3 | 3 | 3 | | |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **INTRODUCTION TO OOPS CONCEPTS AND CLASSES** | **6** |
| Introduction to OOP– Java Fundamentals - Data Types, Variables, and Arrays Operators - Control Statements – Classes – Methods –Constructors- Garbage Collection. | | |
| **Topic - 2** | **STRINGS, INHERITANCE, INTERFACES, AND PACKAGES** | **6** |
| **Strings**: introduction to Strings, String operations**, Inheritance**:- Types of Inheritance, Method overriding, Final keyword. **Packages** and **Interface**s | | |
| **Topic - 3** | **EXCEPTION HANDLING & MULTI-THREADING** | **6** |
| **Exception Handling**: Fundamentals, Types of exception handling, **Multi-threading**: Thread Class, creating multiple threads, life cycle of thread, thread properties | | |
| **Topic - 4** | **I/O STREAMS AND COLLECTION FRAME WORK CLASSES** | **6** |
| **I/O Streams**: Byte Stream Classes and Character Stream Classes. **Collection Frame work** : Hierarchy of collection framework, Array List, Linked List, Vector, Stack, Queue, Priority Queue, Hash Set, Linked Hash Set, Tree Set | | |
| **Topic - 5** | **SWINGS** | **6** |
| **Swing** – Introduction, limitations of AWT, MVC architecture, components, containers, Event Handling- Handling mouse and keyboard events | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **30** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **30** |

| LIST OF EXPERIMENTS | |
|---|---|
| 1 | Write a program to find the factorial of a given number. |
| 2 | Write a program to print numbers in sorting order. |
| 3 | Write a program on illustration of use of packages |
| 4 | Write a program on illustration of use of string operations in java |
| 5 | Write a program to implement interfaces. |
| 6 | Write a program that implements a stack ADT that converts infix expression into postfix expression. |
| 7 | Write a program to read a file and displays the file on the screen within line number before each line. |
| 8 | Write a program to copy contents of a file into another file using File streams. |
| 9 | Write a program for handling Array Index Out of Bounds Exception and Divide-by- zero Exception. |
| 10 | Write a program for custom exception creation. |
| 11 | Write a program on multi-threading showing how CPU time is shared among all the threads. |
| 12 | Write a program for Producer-Consumer problem using threads. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **0** | | **TUTORIAL** | **0** | | **PRACTICAL** | **60** | | **TOTAL** | **60** |

| BOOK REFERENCES | |
|---|---|
| 1 | Object Oriented Programming with Java Laboratory Manual,Al-AmeenPublications,2020 |
| 2. | Herbert Schildt, “Java the Complete Reference”, Ninth edition Tata McGraw Hills, 2014. |
| 3. | Paul Deitel and Harvey Deitel, ―”Java How to Program (Early Objects)”, Tenth Edition, Pearson Prentice Hall2014. |
| 4. | Timothy Budd, ―”An Introduction to Object-Oriented Programming”, Third Edition, Pearson Education, 2008. |
| 5. | E.Balaguruswamy, “Programming with Java”, Sixth Edition, TMH,2019. |

| OTHER REFERENCES | |
|---|---|
| 1 | https://www.w3resource.com/java-exercises/ |
| 2 | https://www.csie.ntu.edu.tw/~d00922011/java/320/java.html |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| III | B.E. CSE & B.Tech. IT | 23CS3LT2 | DATA STRUCTURES & ALGORITHMS | 2 | 0 | 4 | 4 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Understand the concepts of ADTS and Analyze the various Linked list Concepts with algorithms. | K2 | 1 |
| **CO2** | Apply the different linear data structures like stack and queue to various computing problems. | K3 | 2 |
| **CO3** | Understand the uses of various non-linear data structures - trees and analyse their performance. | K2 | 3 |
| **CO4** | Examine the performance of various trees and Graphs.. | K4 | 4 |
| **CO5** | Analyze and understand the concepts of various sorting, searching and hashing algorithms. | K4 | 5 |

| PRE-REQUISITE | FUNDAMENTALS OF COMPUTING AND PROGRAMMING |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | | | | | | 1 | 3 | 3 | | 3 | | 2 |
| CO2 | 2 | 2 | | | | | | 1 | 3 | 3 | 2 | 2 | | 2 |
| CO3 | 3 | 3 | | 3 | | | | 1 | 3 | 3 | | 3 | 2 | |
| CO4 | 2 | 3 | | 3 | | | | 1 | 3 | 3 | | 3 | | |
| CO5 | 2 | | | | | | | 1 | 3 | 3 | 3 | 3 | 3 | |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **LIST** | 6 |
| LISTS Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial ADT. | | |
| **Topic - 2** | **STACKS AND QUEUES** | 6 |
| Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions Infix to Postfix conversion – Queue ADT – Operations – Circular Queue – De Queue – Applications of Queues. | | |
| **Topic - 3** | **TREES** | 6 |
| Tree ADT – Tree Traversals - Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees – Priority Queue (Heaps) – Binary Heap. | | |
| **Topic - 4** | **MULTIWAY SEARCH TREES AND GRAPHS** | 6 |
| B-Tree – B+ Tree – Graph Definition – Representation of Graphs – Types of Graph - Breadth-first traversal – Depth-first traversal — Bi-connectivity – Euler circuits – Topological Sort – Dijkstra's algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm | | |
| **Topic - 5** | **SEARCHING, SORTING AND HASHING TECHNIQUES** | 6 |
| Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort –. Merge Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing –Rehashing – Extendible Hashing | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **30** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **30** |

| LIST OF EXPERIMENTS | |
|---|---|
| 1 | Array implementation of Stack, Queue and Circular Queue ADTs |
| 2 | Implementation of Singly Linked List |
| 3 | Linked list implementation of Stack and Linear Queue ADTs |
| 4 | Implementation of Polynomial Manipulation using Linked list |
| 5 | Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion |
| 6 | Implementation of Binary Search Trees |
| 7 | Implementation of AVL Trees |
| 8 | Implementation of Heaps using Priority Queues |
| 9 | Implementation of Dijkstra’s Algorithm |
| 10 | Implementation of Prim’s Algorithm |

| | |
|---|---|
| 11 | Implementation of Linear Search and Binary Search |
| 12 | Implementation of Insertion Sort and Selection Sort |
| 13 | Implementation of Merge Sort |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **0** | | **TUTORIAL** | **0** | | **PRACTICAL** | **60** | | **TOTAL** | **60** |

| **BOOK REFERENCES** | |
|---|---|
| 1 | Reema Thareja, "Data structures using C, 1'" Edition. Oxford University Press, 2018. |
| 2 | Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed. "Fundamentals of Data Structures in C", 2,4 Edition, University Press, 2017. |
| 3 | Thomas H. Cormen, Charles E. Leiserson,"Introduction to Algorithms", 3rd Edition, 2016. |
| 4 | Robert Sedgewick and Kevin Wayne, "Algorithms", 4th Edtion, 2016 |
| 5 | Michael T. Goodrich, Roberto Tamassia ,"Data Structures and Algorithms in Python", 5th Edition, 2017 |
| 6 | Steven S. Skiena , "The Algorithm Design Manual", Revised Edition, 2019 |

| **OTHER REFERENCES** | |
|---|---|
| 1 | https://www.youtube.com/watch?v=BBpAmxU_NQo |
| 2 | https://www.youtube.com/watch?v=WwfhLC16bis |
| 3 | https://www.youtube.com/watch?v=DWpVGpNfDmM |
| 4 | https://www.youtube.com/watch?v=YWqla0UX-38 |
| 5 | https://www.youtube.com/watch?v=44A_jk4_Rx8 |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| III | B.E. / B.Tech., Common to all | 23EN3L1 | INTERPERSONAL COMMUNICATION SKILLS LAB I | 0 | 0 | 3 | 1.5 |

| After Successful completion of the course, the students should be able to | | RBT Level |
|---|---|---|
| **CO1** | Produce appropriate and accurate language for transactions of various kinds. | K3 |
| **CO2** | Understand and converse with their higher authorities/ subordinates/ other persons concerned. | K3 |
| **CO3** | Expose their personality effectively | K4 |
| **CO4** | Acquire the skills in the key areas of communication viz., socializing, telephoning and negotiations. | K4 |
| **CO5** | Perceive work ethics and work culture. | K2 |

| PRE-REQUISITE | COMMUNICATIVE ENGLISH & TECHNICAL ENGLISH |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO2 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO3 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO4 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |
| CO5 | - | - | - | - | - | - | - | 1 | 3 | 3 | - | 3 | - | - |

| LIST OF EXPERIMENTS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Conversation Practice Sessions (To be done as real-life interactions) | | | | | | | | | |
| 2 | Talking to friends | | | | | | | | | |
| 3 | Listening skills | | | | | | | | | |
| 4 | Email Etiquette | | | | | | | | | |
| 5 | Business English | | | | | | | | | |
| 6 | Discussion on the clips | | | | | | | | | |
| 7 | Decision Making | | | | | | | | | |
| 8 | Developing Conversation | | | | | | | | | |
| **THEORY** | **0** | | **TUTORIAL** | **0** | | **PRACTICAL** | **45** | | **TOTAL** | **45** |

| BOOK REFERENCES | |
|---|---|
| 1 | Communication skills in English by Anjana Tiwari, 2021 |
| 2 | How to improve your communication skills by Dawood Khan,2021. |
| 3 | Communication to connect, 2020. |

| OTHER REFERENCES | |
|---|---|
| 1 | https://youtu.be/cC2vxmBDAG8 |
| 2 | https://youtu.be/l3RSiSUwlT0 |
| 3 | https://youtu.be/cyXADWE7KPo |

## SEMESTER IV

| Sl. No. | Course Code | Course Title | Category | CIA | ESE | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| **THEORY COURSES** | | | | | | | | | |
| 1 | 23HS4T1 | Universal Human Values 2: Understanding Harmony | HS | 100 | - | 2 | 1 | 0 | 3 |
| 2 | 23CS4T2 | Software Engineering | PC | 40 | 60 | 3 | 0 | 0 | 3 |
| 3 | 23CSCT4 | Computer Organization and Architecture | PC | 40 | 60 | 3 | 0 | 0 | 3 |
| 4 | | Open Elective – I | OE | 40 | 60 | 3 | 0 | 0 | 3 |
| **THEORY COURSE WITH LABORATORY COMPONENTS** | | | | | | | | | |
| 5 | 23CS4LT1 | Database Management Systems | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| 6 | 23CS4LT2 | Operating Systems | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| 7 | 23CS4LT3 | Internet Programming | PC | 50 | 50 | 2 | 0 | 4 | 4 |
| **LABORATORY COMPONENTS** | | | | | | | | | |
| 7 | 23EN4L1 | Inter Personal Communication Skills Laboratory - II | HS | 60 | 40 | 0 | 0 | 3 | 1.5 |
| **Total** | | | | | | **17** | **1** | **15** | **25.5** |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| IV | B.E. / B.Tech., Common to all | 20HS4T1 | UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY | 2 | 1 | 0 | 3 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| CO1 | Understand Need, Basic Guidelines, Content and Process for Value Education | K2 | 1 |
| CO2 | Understand Harmony in the Human Being - Harmony in Myself | K2 | 2 |
| CO3 | Understand Harmony in the Family and Society- Harmony in Human Relationship | K2 | 3 |
| CO4 | Understand Harmony in the Nature and Existence - Whole existence as Coexistence | K2 | 4 |
| CO5 | Understand Harmony on Professional Ethics | K2 | 5 |

| PRE-REQUISITE | NIL |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | 2 | 2 | 3 | 3 | | 2 | 2 | |
| CO2 | | | | | | | 2 | 2 | 3 | 3 | | 2 | 2 | |
| CO3 | | | | | | | 2 | 2 | 3 | 3 | | 2 | 2 | |
| CO4 | | | | | | | 2 | 2 | 3 | 3 | | 2 | 2 | |
| CO5 | | | | | | | 2 | 2 | 3 | 3 | | 2 | 2 | |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| DIRECT | 1 | Continuous Assessment Tests |
| INDIRECT | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** | **9** |
| 1. Purpose and motivation for the course, recapitulation from Universal Human Values-I<br>2. Self-Exploration–what is it? - Its content and process; „Natural Acceptance" and Experiential Validation- as the process for self-exploration<br>3. Continuous Happiness and Prosperity- A look at basic Human Aspirations<br>4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority<br>5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario<br>6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. | | |
| **Topic - 2** | **Understanding Harmony in the Human Being - Harmony in Myself!** | **9** |
| 7. Understanding human being as a co-existence of the sentient „I" and the material „Body"<br>8. Understanding the needs of Self („I") and „Body" - happiness and physical facility<br>9. Understanding the Body as an instrument of „I" (I being the doer, seer and enjoyer)<br>10. Understanding the characteristics and activities of „I" and harmony in „I"<br>11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail<br>12. Programs to ensure Sanyam and Health. | | |
| **Topic - 3** | **Understanding Harmony in the Family and Society- Harmony in Human Relationship** | **9** |
| 13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship<br>14. Understanding the meaning of Trust; Difference between intention and competence<br>15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship<br>16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals<br>17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. | | |

| Topic - 4 | Understanding Harmony in the Nature and Existence - Whole existence as Coexistence | 9 |
|---|---|---|

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all pervasive space
21. Holistic perception of harmony at all levels of existence.

| Topic - 5 | Implications of the above Holistic Understanding of Harmony on Professional Ethics | 9 |
|---|---|---|

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up

| THEORY | 45 | | TUTORIAL | 0 | | PRACTICAL | 0 | | TOTAL | 45 |
|---|---|---|---|---|---|---|---|---|---|---|

| BOOK REFERENCES | |
|---|---|
| 1 | Jeevan Vidya: E.K. Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. |
| 2 | Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004 |
| 3 | The Story of Stuff (Book)by Annie Leonard , 2011 |
| 4 | The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi |
| 5 | Small is Beautiful - E. F Schumacher. |
| 6 | Slow is Beautiful - Cecile Andrews |
| 7 | Economy of Permanence - J C Kumarappa |
| 8 | India Wins Freedom - Maulana Abdul Kalam Azad |
| 9 | Vivekananda - Romain Rolland (English) |
| 10 | Gandhi - Romain Rolland (English) |

| OTHER REFERENCES | |
|---|---|
| 1 | **https://www.youtube.com/watch?v=XGxNCFjDGEg** |
| 2 | **https://www.c-span.org/video/?292709-1/the-story-stuff** |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| IV | B.E. CSE & B.Tech. IT | 23CS4T2 | SOFTWARE ENGINEERING | 3 | 0 | 0 | 3 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| **After Successful completion of the course, the students should be able to** | | **RBT Level** | **Topics Covered** |
| **CO1** | Design solutions using common life cycle models for a given software problem | K2 | 1 |
| **CO2** | Apply the Requirement engineering process with emphasis on elicitation analysis and modeling for any given software requirement. | K3 | 2 |
| **CO3** | Identify appropriate design strategies and analyze the requirement specifications for any software system | K2 | 3 |
| **CO4** | Examine various software testing techniques and analyze the given software requirements to determine appropriate testing techniques in commercial software environments | K4 | 4 |
| **CO5** | Inference the process of software project management and estimate the suitable cost | K4 | 5 |

| PRE-REQUISITE | FUNDAMENTALS OF COMPUTING AND PROGRAMMING |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **Programme Learning Outcomes (POs)** | | | | | | | | | | | | **PSOs** | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | | | | | | 1 | 3 | 3 | | 3 | | 2 |
| CO2 | 2 | 2 | | | | | | 1 | 3 | 3 | 2 | 2 | | 2 |
| CO3 | 3 | 3 | | 3 | | | | 1 | 3 | 3 | | 3 | 2 | |
| CO4 | 2 | 3 | | 3 | | | | 1 | 3 | 3 | | 3 | | |
| CO5 | 2 | | | | | | | 1 | 3 | 3 | 3 | 3 | 3 | |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| | 2 | Other Assessments (Assignment, Quiz, etc.) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **THE SOFTWARE PROCESS** | **9** |
| Software Engineering: Generic View of Process – Software Engineering Practice – Software Process Model: Prescriptive Models – Waterfall Models – Increment – Evolutionary and Specialized model – Comparison Study of Software Process Models – Agile Process and Models | | |
| **Topic - 2** | **REQUIREMENTS ANALYSIS AND SPECIFICATION** | **9** |
| Software Requirements: Need for SRS, Requirement Process, Problem Analysis: Informal & formal Approaches, Data Flow Modeling, Object Oriented Modeling, Prototyping, Requirements Specifications: Characteristics of an SRS, Components of SRS, Specification Language, Structure of Requirement Document: IEEE Standards for SRS, Validation, Metrics. | | |
| **Topic - 3** | **SOFTWARE DESIGN** | 9 |
| Designing: Function Oriented Design: Design Principles: Problem Partitioning and Hierarchy, Abstraction, Modularity, Top Down and Bottom-Up Strategies, Module Level Concepts: Coupling, Cohesion; Structure Design Methodology, Verification, Introduction to Object Oriented Design & User Interface Design, Software Measurement Metrics: Various Size Oriented Measures- Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures Control Flow Graphs. | | |
| **Topic - 4** | **SOFTWARE TESTING TECHNIQUES** | 9 |
| Product Specifications - Defining the Final Product - Data Flow Diagram, Data Dictionary, Structured English, Decision Trees, Decision Tables - Feasibility Study. Software Testing : Test Plan - Development Testing : Verification and Validation - General Testing Methods : White Box and Black Box Testing - Unit Testing - System Integration Testing - Validation Testing - System testing | | |
| **Topic - 5** | **PROJECT MANAGEMENT** | **9** |
| Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards. | | |

| **THEORY** | **45** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **45** |
|---|---|---|---|---|---|---|---|---|---|---|

| **BOOK REFERENCES** | |
|---|---|
| 1 | "Clean Architecture: A Craftsman's Guide to Software Structure and Design" by Robert C. Martin (First Edition, 2017). |
| 2 | Roger S. Pressman and Bruce Maxim "Software Engineering: A Hands-On Approach" (Ninth Edition, 2021). |
| 3 | Roger S. Pressman "Software Engineering: A Practitioner's Approach" (Ninth Edition, 2021). |
| 4 | Andrew Hunt and David Thomas "The Pragmatic Programmer: Your Journey to Mastery" (20th Anniversary Edition, 2019). |
| 5 | Roger S. Pressman and Bruce Maxim "Software Engineering: A Practitioner's Guide" (Ninth Edition, 2021). |
| 6 | Roger S. Pressman and Bruce Maxim "Software Engineering: A Hands-On Approach" (Ninth Edition, 2021). |

| **OTHER REFERENCES** | |
|---|---|
| 1 | https://en.wikipedia.org/wiki/Software_engineering |
| 2 | https://www.geeksforgeeks.org/software-engineering/ |
| 3 | https://www.youtube.com/watch?v=Ws6zCMdp9Es |
| 4 | https://www.youtube.com/watch?v=IHx9ImEMuzQ |
| 5 | https://www.geeksforgeeks.org/software-engineering-introduction-to-software-engineering/ |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| IV | B.E. CSE & B.Tech. IT | 23CSCT4 | COMPUTER ORGANIZATION AND ARCHITECTURE | 3 | 0 | 0 | 3 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Identify the basics structure of computers, operations and instructions. | K3 | 1 |
| **CO2** | Illustrate the arithmetic and logic unit. | K2 | 2 |
| **CO3** | Analyze pipelined execution and design control unit. | K4 | 3 |
| **CO4** | Classify the parallel processing architectures. | K4 | 4 |
| **CO5** | Organize the various memory systems and I/O communication. | K3 | 5 |

| PRE-REQUISITE | FUNDAMENTALS OF COMPUTING PROGRAMMING |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | | | | | 2 | 2 | 3 | 3 | | 3 | | |
| CO2 | 3 | | 2 | | | | 2 | 2 | 3 | 3 | | 3 | 2 | |
| CO3 | 3 | | | | | | 2 | 2 | 3 | 3 | | 3 | | |
| CO4 | 3 | 3 | | | | | 2 | 2 | 3 | 3 | | 3 | | |
| CO5 | | 3 | 2 | | | | 2 | 2 | 3 | 3 | | 3 | 2 | |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests |
| | 2 | Other Assessments (Assignment, Quiz etc.) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **BASIC STRUCTUTRE OF COMPUTERS** | **9** |
| Functional Units — Basic Operational Concepts — Performance — Instructions: Language of the Computer — Operations, Operands — Instruction representation — Logical operations — decision making — MIPS Addressing. | | |
| **Topic - 2** | **ARITHMETIC FOR COMPUTER** | **9** |
| Addition and Subtraction — Multiplication — Division — Floating Point Representation — Floating Point Operations — Subword Parallelism. | | |
| **Topic - 3** | **PROCESSOR AND CONTROL UNIT** | **9** |
| A Basic MIPS implementation — Building a Datapath — Control Implementation Scheme — Pipelining — Pipelined datapath and control — Handling Data Hazards & Control Hazards — Exceptions. | | |
| **Topic - 4** | **PARALLELISIM** | **9** |
| Parallel processing challenges — Flynn's classification — SISD, MIMD, SIMD, SPMD, and Vector Architectures — Hardware multithreading — Multi-core processors and other Shared Memory Multiprocessors — Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors. | | |
| **Topic - 5** | **MEMORY & I/O SYSTEM** | **9** |
| Memory Hierarchy — memory technologies — cache memory — measuring and improving cache performance — virtual memory, TLB?s — Accessing I/O Devices — Interrupts — Direct Memory Access — Bus structure — Bus operation — Arbitration — Interface circuits — USB. | | |

| **THEORY** | **45** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **45** |
|---|---|---|---|---|---|---|---|---|---|---|

| **BOOK REFERENCES** | |
|---|---|
| 1 | "Computer Architecture: A Quantitative Approach" by John L. Hennessy and David A. Patterson (6th Edition, 2021). |
| 2 | "Computer Organization: Basic Processor Structure" by Robert L. Boccia (1st Edition, 2017). |
| 3 | "Essentials of Computer Organization and Architecture" by Linda Null and Julia Lobur (4th Edition, 2019). |
| 4 | "Introduction to Computer Architecture: A General Purpose Approach" by Anshuman Sahu (1st Edition, 2019). |
| 5 | "Computer Systems: Theory, Technology, and Applications" by Gabriel Heifets (1st Edition, 2018). |
| 6 | "Computer Architecture and Organization: From 8085 to Core2Duo and Beyond" by Subrata Ghoshal |

| **OTHER REFERENCES** | |
|---|---|
| 1 | https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/ |
| 2 | https://www.javatpoint.com/computer-organization-and-architecture-tutorial |
| 3 | https://www.youtube.com/watch?v=Ol8D69VKX2k |
| 4 | https://www.youtube.com/watch?v=IbEr8B09W-M |
| 5 | https://medium.com/@longeardev/computer-organization-and-architecture-fundamentals-of-computer-organization-bdd7dc4c0219 |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| IV | B.E. CSE / B.Tech. IT | 23CS4LT1 | DATABASE MANGEMENT SYSTEM | 2 | 0 | 4 | 4 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| **CO1** | Explain the basic concepts of the database management systems | K2 | 1 |
| **CO2** | Examine SQL queries to create, manipulate and control the database | K3 | 2 |
| **CO3** | Apply normalization technique to design database | K3 | 3 |
| **CO4** | Analyse database transactions using ACID properties | K4 | 4 |
| **CO5** | Compare the various storage and optimization techniques | K4 | 5 |

| PRE-REQUISITE | FUNDAMENTALS OF COMPUTING AND PROGRAMMING |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO 11 | PO12 | PSO1 | PSO2 |
| CO1 | 2 | 1 | | - | - | - | - | - | - | - | - | 2 | 3 | 2 |
| CO2 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | 3 | 3 |
| CO3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 2 | 3 | 3 |
| CO4 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 2 | 3 | 3 |
| CO5 | 2 | 1 | - | - | 3 | - | - | - | - | - | - | 2 | 3 | 2 |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **INTRODUCTION TO RELATIONAL DATABASE** | **6** |
| What is database system-purpose of database system-view of data-relational databases-database architecture-transaction management--Database Schema and Diagram Relational Algebra — ER Diagrams — Entities. Attributes, Relationships, Constraints, | | |
| **Topic - 2** | **STRUCTURED QUERY LANGUAGE** | **6** |
| Basics of SQL, DDL, DML,DCL,TCL — creation, alteration, defining constraints — Functions —aggregate functions, Built-in functions — Views — Joins — Procedure | | |
| **Topic - 3** | **DATABASE DESIGN** | **6** |
| Relational database model: Logical view of data, keys, integrity rules. Functional dependencies - Normalization - Normal forms based on primary keys (1 NF, 2NF, 3NF, BCNF, 4NF, 5NF) - Triggers – Cursor | | |
| **Topic - 4** | **TRANSACTION MANAGEMENT** | **6** |
| Transaction management: ACID properties-serializability and concurrency control-Lock based concurrency control (2PL, Deadlocks),Time stamping methods- optimistic methods-database recovery management. | | |
| **Topic - 5** | **IMPLEMENTATION TECHNIQUES AND NoSQL DATABASE** | **6** |
| Indexing and Hashing - Si- tree Index Files - B Tree Index Files - Query Processing and optimization - Introduction to NoSQL Databases - Types of NOSQL Databases- NoSQLVs SQL - Limitations of NoSQL - Basics of MONGODB | | |

| **THEORY** | **30** | **TUTORIAL** | **0** | **PRACTICAL** | **0** | **TOTAL** | **30** |
|---|---|---|---|---|---|---|---|

| LIST OF EXPERIMENTS | |
|---|---|
| **Experiment-1** | Conceptual Database design using E-R model — case study |
| **Experiment-2** | Implementation of SQL commands DDL, DCL, TCL |
| **Experiment-3** | Queries to demonstrate implementation of various integrity and key constraints |
| **Experiment-4** | Practice on various DML commands to write a query to interact with database |
| **Experiment-5** | Practice on and aggregate functions and views |
| **Experiment-6** | Implement joins, nested queries and stored procedures |
| **Experiment-7** | Practice on procedural extensions (Functions, Cursors, Triggers) |
| **Experiment-8** | Document Database creation using Mongo DB |
| **Experiment-9** | Creation of database objects: Synonyms, Sequences, Views, Indexes and save point |
| **Experiment-10** | Create an Employee database to set various constraints |

| **THEORY** | **0** | **TUTORIAL** | **0** | **PRACTICAL** | **60** | **TOTAL** | **60** |
|---|---|---|---|---|---|---|---|

| BOOK REFERENCES | |
|---|---|
| 1 | "Database System Concepts" by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan (7th Edition, 2019). |
| 2 | "SQL Performance Explained" by Markus Winand (latest edition: 2nd Edition, 2018). |
| 3 | "Modern Database Management" by Jeffrey A. Hoffer, Ramesh Venkataraman, and Heikki Topi (latest edition: 13th Edition, 2018). |
| 4 | "Database Systems: Design, Implementation, and Management" by Carlos Coronel, Steven Morris, and Peter Rob (latest edition: 13th Edition, 2019). |
| 5 | "SQL Queries for Mere Mortals: A Hands-On Guide to Data Manipulation in SQL" by John L. Viescas and Michael J. Hernandez (latest edition: 4th Edition, 2018). |
| 6 | "Database Internals: A Deep Dive into How Distributed Data Systems Work" by Alex Petrov (latest edition: 1st Edition, 2019). |

| OTHER REFERENCES | |
|---|---|
| 1 | Pramod J. Sadalage and Mann Fowler, "NOSQL Distilled: A Brief guide to merging world of Polyglot persistence", 24 Edition, Addision Wesley, 2012. |
| 2 | Ramakrishnan and Gehrke, 'Database Management Systems", 3,4 Edition, McGraw Hill, 2003. |
| 3 | https://nptetac.inlcourses/106/105/106105175/. |
| 4 | https://www.edureka.co/mongodb-certification-training. |
| 5 | httpsfhwAv.coursera.orgAeamnntroduction-to-nosql-databases. |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| IV | B.E. CSE / B.Tech. IT | 23CS4LT2 | **OPERATING SYSTEMS** | 2 | 0 | 4 | 4 |

| **COURSE LEARNING OUTCOMES (COs)** | | | |
|---|---|---|---|
| **After Successful completion of the course, the students should be able to** | | **RBT Level** | **Topics Covered** |
| **CO1** | Describe the important computer system resources and the role of operating system. | K2 | 1 |
| **CO2** | Identify the various CPU scheduling algorithms and to handle deadlock mechanisms. | K2 | 2 |
| **CO3** | Compare and contrast various memory management schemes. | K2 | 3 |
| **CO4** | Implementation of functionality of file system and I/O system. | K3 | 4 |
| **CO5** | Perform administrative tasks on Linux Servers. | K3 | 5 |

| **PRE-REQUISITE** | **OBJECT ORIENTED PROGRAMMING WITH JAVA** |
|---|---|

| **CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **Programme Learning Outcomes (POs)** | | | | | | | | | | | | **PSOs** | |
| | 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 |
| CO1 | 3 | 2 | 3 | - | - | - | 2 | 2 | 3 | 3 | 2 | 3 | - | - |
| CO2 | 1 | 2 | 3 | 2 | 2 | - | 2 | 2 | 3 | 3 | - | 3 | - | 2 |
| CO3 | 3 | 2 | 2 | - | - | - | 2 | 2 | 3 | 3 | 2 | 3 | - | 2 |
| CO4 | 1 | 3 | 2 | 2 | - | - | 2 | 2 | 3 | 3 | - | 3 | 2 | - |
| CO5 | 3 | 2 | - | - | - | - | 2 | 2 | 3 | 3 | 3 | 3 | - | 2 |

| **COURSE ASSESSMENT METHODS** | | |
|---|---|---|
| **DIRECT** | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| **INDIRECT** | 1 | Course Exit Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **OPERATING SYSTEM OVERVIEW** | **6** |
| Computer System Overview – Basic Elements - Operating system Overview - Evolution of Operating System; Operating System Structures and Services - System Calls - System Programs - OS Generation and System Boot. | | |
| **Topic - 2** | **PROCESS MANAGEMENT** | **6** |
| Process concepts - Process Scheduling - Inter-process Communication ; CPU Scheduling criteria and algorithms - Threads - Threading issues; Process Synchronization - The Critical-Section problem-Semaphore - Mutex – Synchronization problems. Deadlock – Deadlock prevention, avoidance and Detection. | | |
| **Topic - 3** | **MEMORY MANAGEMENT** | **6** |
| Main Memory - Contiguous allocation - Paging – Segmentation, Segmentation with paging; Virtual Memory - Demand paging - Page Replacement Algorithms - Thrashing. | | |
| **Topic - 4** | **FILE SYSTEMS AND I/O SYSTEMS** | **6** |
| Disk Structure – Disk Scheduling, swap space management ; File concept – Directory Structure- File system mounting, File Sharing and Protection; File System Structure, Directory implementation, Allocation Methods,Free Space Management ; I/O Systems – I/O Hardware - Application I/O interface, Kernel I/O subsystem, Streams, Performance. | | |
| **Topic - 5** | **OS DESIGN PRINCIPLES** | **6** |
| Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System; Mobile OS -iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **30** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **30** |

| COURSE CONTENT | |
|---|---|
| **Experiment-1** | Write programs using basic Unix commands and shell programming. |
| **Experiment-2** | Write programs using process and file management system calls of UNIX operating system. |
| **Experiment-3** | Develop programs to Implement CPU scheduling algorithms (FCFS, SJF, SRTF, Priority, and Round Robin). |
| **Experiment-4** | Developing application to implement Inter Process Communication using shared memory and pipes. |
| **Experiment-5** | Develop a program to understand synchronization using producer-consumer problem. |
| **Experiment-6** | Develop a program to understand deadlock avoidance using Bankers algorithm. |
| **Experiment-7** | Develop programs to implement the page replacement algorithms (FIFO, Optimal, and LRU). |
| **Experiment-8** | Develop programs to implement disk scheduling algorithms (FCFS, SSTF, SCAN, C-SCAN). |
| **Experiment-9** | Implementation of the various File Organization Techniques ( Sequential , Random and Serial). |
| **Experiment-10** | Implementation of the following File Allocation Strategies a) Sequential b) Indexed C) linked. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **0** | | **TUTORIAL** | **0** | | **PRACTICAL** | **60** | | **TOTAL** | **60** |

| BOOK REFERENCES | |
|---|---|
| 1 | Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”,9th Edition, John Wiley and Sons Inc., 2013. |
| 2 | Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”,Tata McGraw Hill Edition, 2010. |
| 3 | Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Pearson Education, 2004. |
| 4 | Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O‘Reilly, 2005. |
| 5 | Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011. |

| OTHER REFERENCES | |
|---|---|
| 1 | https://en.wikipedia.org/wiki/Operating_system |
| 2 | https://www.geeksforgeeks.org/what-is-an-operating-system/ |
| 3 | https://www.javatpoint.com/operating-system |
| 4 | https://www.youtube.com/watch?v=fkGCLIQx1MI |
| 5 | https://www.youtube.com/watch?v=26QPDBe-NB8 |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| IV | B.Tech. IT | 23CS4LT3 | INTERNET PROGRAMMING | 2 | 0 | 4 | 4 |

| COURSE LEARNING OUTCOMES (COs) | | | |
|---|---|---|---|
| After Successful completion of the course, the students should be able to | | RBT Level | Topics Covered |
| CO1 | Analyze the concept of web programming and construct a basic website using HTML and CSS. | K3 | 1 |
| CO2 | Describe how the client-server model works and validate dynamic web page using java script objects . | K3 | 2 |
| CO3 | Develop server side programs using servlets with database connectivity. | K4 | 3 |
| CO4 | Use PHP to create simple scripts for the creation of web sites. | K3 | 4 |
| CO5 | Demonstrate how to represent the data in XML Format. | K4 | 5 |

| PRE-REQUISITE | PYTHON PROGRAMMING |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Learning Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 1 | | | 3 | 2 | | 1 | 3 | 3 | | 3 | 2 | 1 |
| CO2 | 3 | 1 | 1 | | 3 | 2 | | 1 | 3 | 3 | 2 | 3 | 3 | 2 |
| CO3 | 3 | | 1 | | 3 | 2 | | 1 | 3 | 3 | 1 | 2 | 3 | 2 |
| CO4 | 3 | 1 | 2 | | 3 | 2 | | 1 | 3 | 3 | 2 | 3 | 3 | 2 |
| CO5 | 3 | | | | | | | 1 | 3 | 3 | | 3 | | |

| COURSE ASSESSMENT METHODS | | |
|---|---|---|
| DIRECT | 1 | Continuous Assessment Tests (Theory Component) |
| | 2 | Laboratory Record and Model Practical Examinations (Laboratory Component) |
| | 3 | End Semester Examinations |
| INDIRECT | 1 | Course End Survey |

| COURSE CONTENT | | |
|---|---|---|
| **Topic - 1** | **BASICS AND HTML** | **6** |
| Internet Overview - Web Protocols - URL – Web Browsers and Web Servers – Creating a Website.<br>Structure of HTML - Input Elements - Images, Tables, Frames - Form and its controls – CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Multimedia components, Animations, Dynamic HTML. | | |
| **Topic - 2** | **CLIENT-SIDE SCRIPTING** | **6** |
| Introduction to JavaScript, Variables and Data Types – Operators - Functions- Objects-Arrays-Built-in Objects- Regular Expression, Exceptions, Event handling, Windows and Frames - Forms and Validation. | | |
| **Topic - 3** | **SERVLETS** | **6** |
| Servlets: Java Servlet Architecture – Servlet Life cycle- Form GET and POST actions -Sessions – Cookies – Database connectivity - JDBC | | |
| **Topic - 4** | **SERVER SIDE SCRIPTING** | **6** |
| PHP and Working principle , Features of PHP- Data Types - Variables - Operators - Control Structures - Arrays -Functions - File Handling - Simple PHP scripts - Working with Databases. | | |
| **Topic - 5** | **XML** | **6** |
| Introduction to XML– Elements -XML Namespaces ,DTD - Defining DTD entities, Parameter entities - Defining attributes - CSS basics - Adding CSS to document - XSL basics -XSL transformations - Schemas - XML query. | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **30** | | **TUTORIAL** | **0** | | **PRACTICAL** | **0** | | **TOTAL** | **30** |

| LIST OF EXPERIMENTS | |
|---|---|
| 1 | Create a web page with the following using HTML and CSS<br>i) To embed a map in a web page<br>ii)Show all the related information when the hot spots are clicked<br>iii) Cascading ,Embedded and Inline style sheets. |
| 2 | Validate the Registration, user login, user profile and payment by credit card pages usingJavaScript. |
| 3 | Write programs in Java using Servlets:<br>i)To invoke servlets from HTML forms ii) Session tracking using hidden form fields and Session tracking for a hit count |
| 4 | Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate<br>Shopping Cart. |
| 5 | Write programs in Java to create three-tier applications using servlets for conducting on-line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server. |

| | |
|---|---|
| 6 | Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by takingthe user information from the XML document |
| 7 | i)Validate the form using PHP regular expression.<br>ii) PHP stores a form data into database. |
| 8 | Write a web service for finding what people think by asking 500 people‘s opinion for anyconsumer product. |
| 9 | Write a program in Java for creating simple chat application with datagram sockets and datagram packets. |
| 10 | Write programs in Java to do the following.<br>• Set the URL of another server.<br>• Download the homepage of the server.<br>• Display the contents of home page with date, content type, and Expiration date. Last modified and length of the home page. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | **0** | | **TUTORIAL** | **0** | | **PRACTICAL** | **60** | | **TOTAL** | **60** |

| **BOOK REFERENCES** | |
|---|---|
| 1 | Stephen Wynkoop and John Burke ―Running a Perfect Website‖, QUE, 2nd Edition,1999. |
| 2 | Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009. |
| 3 | Jeffrey C and Jackson, ―Web Technologies A Computer Science Perspective‖, Pearson Education, 2011 |
| 4 | Gopalan N.P. and Akilandeswari J., ―Web Technology‖, Prentice Hall of India, 2011. |

| **OTHER REFERENCES** | |
|---|---|
| 1 | https://www.w3schools.com/html/ |
| 2 | https://en.wikipedia.org/wiki/JavaScript |
| 3 | https://www.php.net/ |
| 4 | https://www.youtube.com/watch?v=rJesac0_Ftw |
| 5 | https://youtu.be/rJesac0_Ftw |

| Semester | Programme | Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|---|---|
| IV | B.E. / B.Tech., Common to all | 23EN4L1 | INTERPERSONAL COMMUNICATION SKILLS LAB - II | 0 | 0 | 3 | 1.5 |

| After Successful completion of the course, the students should be able to | | RBT Level |
|---|---|---|
| **CO1** | Equip them with the English language skills required for the successful Undertaking of academic studies. | K3 |
| **CO2** | Read and understand any text in English according to the inputs given by the teacher in the classroom. | K2 |
| **CO3** | Write and speak good English in all situations. | K4 |
| **CO4** | Acquire guidance and practice in general and classroom conversation and to engage in specific academic speaking activities. | K4 |
| **CO5** | Make effective presentations. | K2 |

| PRE-REQUISITE | COMMUNICATIVE ENGLISH, TECHNICAL ENGLISH & INTERPERSONAL COMMUNICATION SKILLS LAB - I |
|---|---|

| CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **Programme Learning Outcomes (POs)** | | | | | | | | | | | | **PSOs** | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | 3 | | 3 | | |
| CO2 | | | | | | | | | 2 | 3 | | 3 | | |
| CO3 | | | | | | | | | 2 | 3 | | 3 | | |
| CO4 | | | | | | | | | 2 | 3 | | 3 | | |
| **CO5** | | | | | | | | | | 3 | | 3 | | |

| LIST OF EXPERIMENTS | |
|---|---|
| 1 | Role Play |
| 2 | Empathy |
| 3 | Time Management |
| 4 | Body Language |
| 5 | Mock Interview |
| 6 | Group Discussion |
| 7 | Presentation |
| 8 | Team Building Skills |

| THEORY | 0 | | TUTORIAL | 0 | | PRACTICAL | 45 | | TOTAL | 45 |
|---|---|---|---|---|---|---|---|---|---|---|

| BOOK REFERENCES | |
|---|---|
| 1 | Commmunication Skill by Dale Carnegie,2022. |
| 2 | Communication: Core Interpersonal Skills by Gjyn O'Toolee,2020. |
| 3 | Effective Commmunication in the workplace by David L.Lewis,2019. |
| 4 | Communication skills/ BBA- 1 YEAR (NEP2020 (NEP2020 Department Of Higher Education ) Madhya Pradesh (Paperback, Dr. Sumit Kishore Mathur, Dr. Awanti Dixit) |

| OTHER REFERENCES | |
|---|---|
| 1 | https://youtu.be/cC2vxmBDAG8 |
| 2 | https://youtu.be/l3RSiSUwlT0 |
| 3 | https://youtu.be/cyXADWE7KPo |