# DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE

**(An Autonomous Institution, Affiliated to Anna University, Chennai)**

## PERAMBALUR - 621212

## REGULATIONS – 2023

## CHOICE BASED CREDIT SYSTEM

## B.Tech. IT

## CURRICULUM & SYLLABI

## DEPARTMENT OF INFORMATION TECHNOLOGY

**(Applicable to students admitted from the Academic year 2023 – 2024 and subsequently under Choice Based Credit System)**

# VISION AND MISSION OF THE INSTITUTUION

## VISION

An active and committed centre of advanced learning focused on research and training in the fields of Engineering, Technology and Management to serve the nation better.

## MISSION

**M1** To develop eminent scholar with a lifelong, follow up of global standards by offering UG, PG and Doctoral Programmes.

**M2** To pursue Professional and Career growth by collaborating mutually beneficial partnership with industries and higher institutes of research.

**M3** To promote sustained research and training with emphasis on human values and leadership qualities.

**M4** To contribute solutions for the need-based issues of our society by proper ways and means as dutiful citizen.

# DEPARTMNET OF INFORMATION TECHNOLOGY

## ABOUT THE DEPARTMENT

The department was established in the year 2001. It has highly qualified, committed & research-oriented faculty members with shares the mission & vision of the institution. The department was accredited by NBA in 2009.

Inception in the year 2001, with the well-knit faculty demonstrating high professionalism puts the graduating engineers. The Department faculty members are specialized in software engineering, Data mining, Computer Networks, Soft Computing, Data Science, Network Security, Cyber Security, Big Data Analytics, Image Processing, we got autonomous status on 2020 and Re-accredited with 'A' Grade by NAAC. The curriculum is framed to cater to the requirements of both industry deployments for recent trends and research activities. Department got permanent affiliation from Anna University in the year 2012.

## VISION

To cultivate ethical and knowledgeable IT professionals, researchers, and entrepreneurs while fostering excellence in Information Technology and related fields.

## MISSION

**M1** The department of Information Technology is committed to enhance students' knowledge and computing skills through state-of-the-art infrastructure.

**M2** The department of Information Technology is committed to foster academic, employability, and research skills in Information Technology through innovative teaching methods

**M3** The department of Information Technology is committed to motivate and equip students for higher education or entrepreneurial ventures through industry-institute interactions.

**M4** The department of Information Technology is committed to cultivate leadership, professional communication skills, and ethical values through dedicated soft skills training for serving society.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of the B.Tech. in Information Technology program will:

| | |
|---|---|
| **PEO 1** | Apply computing solutions to real-world problems in Information Technology (IT) and related interdisciplinary domains. |
| **PEO 2** | Pursue lifelong learning, staying updated in their profession, and acquiring additional qualifications to advance their career positions in the IT industry. |
| **PEO 3** | Demonstrate effective communication, interpersonal skills, and ethical conduct while collaborating in multidisciplinary settings, both as team members and leaders. |

## PROGRAM OUTCOMES (POs)

| PO | Graduate Attribute |
|---|---|
| PO1 | **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| PO2 | **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. |
| PO3 | **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. |
| PO4 | **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. |
| PO5 | **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. |
| PO6 | **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. |
| PO7 | **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. |
| PO8 | **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| PO9 | **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| PO10 | **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. |
| PO11 | **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. |
| PO12 | **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)

After successful completion of B.Tech. program in Information Technology, the graduates will be able to:

| | |
|---|---|
| **PSO 1** | Acquire appreciable knowledge in the areas of Programming languages, Web technologies, Database and Multimedia. |
| **PSO 2** | Design, develop and test application and research-oriented software to provide solutions to Information Technology industry. |

# DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE
# (AUTONOMOUS), PERAMBALUR – 621 212
## B.Tech. IT
### REGULATIONS – 2023
### CHOICE BASED CREDIT SYSTEM

**SEMESTER I**

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | IP3151 | Induction Programme | - | - | - | - | - | - |
| 2 | U23HST11 | Communicative English | HMS | 3 | 0 | 0 | 45 | 3 |
| 3 | U23MAT12 | Matrices and Calculus | BS | 3 | 1 | 0 | 60 | 4 |
| 4 | U23BST13 | Physics for Engineers and Technologists | BS | 3 | 0 | 0 | 45 | 3 |
| 5 | U23CYT14 | Chemistry for Engineering & Technology | BS | 3 | 0 | 0 | 45 | 3 |
| 6 | U23GET15 | Problem solving and Python Programming | ES | 3 | 0 | 0 | 45 | 3 |
| 7 | GE3152 | தமிழர் மரபு / Heritage of Tamils | HS | 1 | 0 | 0 | 1 | 1 |
| **PRACTICAL** | | | | | | | | |
| 8 | U23BSP11 | Physics and Chemistry Laboratory | BS | 0 | 0 | 4 | 60 | 2 |
| 9 | U23GEP13 | Problem solving and Python Programming Laboratory | ES | 0 | 0 | 4 | 60 | 2 |
| 10 | U23HSP12 | English Laboratory | HMS | 0 | 0 | 2 | 30 | 1 |

**SEMESTER II**

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23HST21 | Professional English | HMS | 3 | 1 | 0 | 30 | 2 |
| 2 | U23MAT22 | Statistical and Numerical Methods | BS | 3 | 0 | 0 | 60 | 4 |
| 3 | U23PHT25 | Physics for Information Science | BS | 3 | 0 | 0 | 45 | 3 |
| 4 | U23CST21 | Programming in C | PC | 3 | 0 | 0 | 45 | 3 |
| 5 | U23EET23 | Basic Electrical and Electronics Engineering | ES | 0 | 0 | 3 | 45 | 3 |
| 6 | U23ECT23 | Digital Principles and System Design | ES | 3 | 0 | 0 | 45 | 3 |
| 7 | GE3252 | தமிழரும் தொழில்நுட்பமும் / Tamils and Technology | HS | 1 | 0 | 0 | 1 | 1 |
| **PRACTICAL** | | | | | | | | |
| 8 | U23CSP21 | Programming in C Laboratory | PC | 0 | 0 | 4 | 60 | 2 |
| 9 | U23HSP22 | Communication Laboratory | EEC | 0 | 0 | 4 | 60 | 2 |

## SEMESTER III

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23MAT32 | Discrete Mathematics | BS | 3 | 1 | 0 | 60 | 4 |
| 2 | U23ITT31 | Computer Organization and Architecture | ES | 3 | 0 | 0 | 45 | 3 |
| 3 | U23ITT32 | Data Structures | PC | 3 | 0 | 0 | 45 | 3 |
| 4 | U23ITT33 | Database Management Systems | PC | 3 | 0 | 0 | 45 | 3 |
| 5 | U23ITT34 | Object Oriented Programming | PC | 3 | 0 | 0 | 45 | 3 |
| **PRACTICAL** | | | | | | | | |
| 6 | U23ITP31 | Object oriented Programming Laboratory | PC | 0 | 0 | 4 | 60 | 2 |
| 7 | U23ITP32 | Data Structures Laboratory | PC | 0 | 0 | 4 | 60 | 2 |
| 8 | U23ITP33 | Database Management Systems Laboratory | PC | 0 | 0 | 4 | 60 | 2 |

## SEMESTER IV

| Sl. No.. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITT41 | Design and Analysis of Algorithms | PC | 3 | 1 | 0 | 60 | 4 |
| 2 | U23ITT42 | Operating System | PC | 3 | 1 | 0 | 60 | 3 |
| 3 | U23ITT43 | Web Technology | PC | 3 | 0 | 0 | 45 | 3 |
| 4 | U23ITT44 | Computer Networks | PC | 3 | 0 | 0 | 45 | 3 |
| 5 | U23GET41 | Environmental sciences and sustainability | HMS | 3 | 0 | 0 | 45 | 3 |
| **PRACTICAL** | | | | | | | | |
| 6 | U23ITP41 | Operating Systems Laboratory | PC | 0 | 0 | 4 | 60 | 2 |
| 7 | U23ITP42 | Computer Networks Laboratory | PC | 0 | 0 | 4 | 60 | 2 |
| 8 | U23ITP43 | Web Technology Laboratory | PC | 0 | 0 | 4 | 60 | 2 |

## SEMESTER V

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITT51 | Cloud Computing | PC | 3 | 0 | 0 | 45 | 3 |
| 2 | U23ITT52 | Foundations of Data Science | PC | 3 | 0 | 0 | 45 | 3 |
| 3 | | Professional Elective - I | PE | 3 | 0 | 0 | 45 | 3 |
| 4 | | Professional Elective - II | PE | 3 | 0 | 0 | 45 | 3 |
| 5 | | Open Elective - I | OE | 3 | 0 | 0 | 45 | 3 |
| 6 | U23SKT01 | Skill Course I – MS Office | - | - | - | - | - | - |
| **PRACTICAL** | | | | | | | | |
| 7 | U23ITP51 | Cloud Computing Laboratory | PC | 0 | 0 | 4 | 60 | 2 |
| 8 | U23ITP52 | Data Science Laboratory | PC | 0 | 0 | 4 | 60 | 2 |

## SEMESTER VI

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITT61 | Big Data Analytics | PC | 3 | 0 | 0 | 45 | 3 |
| 2 | U23ITT62 | Artificial Intelligence and Machine Learning | PC | 3 | 0 | 0 | 45 | 3 |
| 3 | U23ITT64 | Information Security | PC | 3 | 0 | 0 | 45 | 3 |
| 4 | | Professional Elective - III | PE | 3 | 0 | 0 | 45 | 3 |
| 5 | | Professional Elective - IV | PE | 3 | 0 | 0 | 45 | 3 |
| 6 | | Open Elective - II | OE | 3 | 0 | 0 | 45 | 3 |
| **PRACTICAL** | | | | | | | | |
| 7 | U23ITP61 | Big Data Analytics Laboratory | PC | 0 | 0 | 4 | 60 | 2 |
| 8 | U23ITP62 | Machine Learning Laboratory | PC | 0 | 0 | 4 | 60 | 2 |

## SEMESTER VII

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITT71 | Internet of Things | PC | 3 | 0 | 0 | 45 | 3 |
| 2 | | Human Values and Ethics | EEC | 3 | 0 | 0 | 45 | 3 |
| 3 | U23ITT72 | Software Engineering and Project Management | PC | 3 | 0 | 0 | 45 | 3 |
| 4 | | Professional Elective - V | PE | 3 | 0 | 0 | 45 | 3 |
| 5 | | Open Elective - Management | HMS | 3 | 0 | 0 | 45 | 3 |
| 6 | U23SKT01 | Skill Course II – Computer Installation & Troubleshooting | - | - | - | - | - | - |
| **PRACTICAL** | | | | | | | | |
| 6 | U23ITP71 | Internet of Things Laboratory | PC | 0 | 0 | 4 | 60 | 2 |
| 7 | U23ITP72 | Mini Project | EEC | 0 | 0 | 2 | 30 | 2 |

## SEMESTER VIII

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | | Professional Elective - VI | PE | 3 | 0 | 0 | 45 | 3 |
| 2 | | Professional Elective - VIII | PE | 3 | 0 | 0 | 45 | 3 |
| **PRACTICAL** | | | | | | | | |
| 3 | U23ITP81 | Project Work | EEC | 0 | 0 | 12 | 180 | 10 |

## PROFESSIONAL ELECTIVE
## VERTICALS – I (DATA SCIENCE)

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITV11 | Theory of Computation | PE | 3 | 0 | 0 | 45 | 3 |
| 2 | U23ITV12 | Neural Networks and Deep Learning | PE | 3 | 0 | 0 | 45 | 3 |
| 3 | U23ITV13 | Text and Speech Analysis | PE | 3 | 0 | 0 | 45 | 3 |
| 4 | U23ITV14 | Recommender Systems | PE | 3 | 0 | 0 | 45 | 3 |
| 5 | U23ITV15 | Business Analytics | PE | 3 | 0 | 0 | 45 | 3 |
| 6 | U23ITV16 | Computer Vision | PE | 3 | 0 | 0 | 45 | 3 |
| 7 | U23ITV17 | Social Network Security | PE | 3 | 0 | 0 | 45 | 3 |
| 8 | U23ITV18 | Predictive Analytics | PE | 3 | 0 | 0 | 45 | 3 |

## VERTICALS – II (FULL STACK DEVELOPMENT OF IT)

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITV21 | Principles of Programming Languages | PE | 3 | 0 | 0 | 45 | 3 |
| 2 | U23ITV22 | Advanced Java Programming | PE | 3 | 0 | 0 | 45 | 3 |
| 3 | U23ITV23 | Full Stack Web Development | PE | 3 | 0 | 0 | 45 | 3 |
| 4 | U23ITV24 | UI and UX Design | PE | 3 | 0 | 0 | 45 | 3 |
| 5 | U23ITV25 | Software Testing and Automation | PE | 3 | 0 | 0 | 45 | 3 |
| 6 | U23ITV26 | Web Application Security | PE | 3 | 0 | 0 | 45 | 3 |
| 7 | U23ITV27 | DevOps | PE | 3 | 0 | 0 | 45 | 3 |
| 8 | U23ITV28 | Full Stack Mobile App Development | PE | 3 | 0 | 0 | 45 | 3 |

## VERTICALS – III (CLOUD COMPUTING AND DATA CENTRE TECHNOLOGIES)

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITV31 | Data Warehousing | PE | 3 | 0 | 0 | 45 | 3 |
| 2 | U23ITV32 | Cloud Virtualization | PE | 3 | 0 | 0 | 45 | 3 |
| 3 | U23ITV33 | Cloud Services Management | PE | 3 | 0 | 0 | 45 | 3 |
| 4 | U23ITV34 | Computational Bioinformatics | PE | 3 | 0 | 0 | 45 | 3 |
| 5 | U23ITV35 | Storage Technologies | PE | 3 | 0 | 0 | 45 | 3 |
| 6 | U23ITV36 | Software Defined Networks | PE | 3 | 0 | 0 | 45 | 3 |
| 7 | U23ITV37 | Stream Processing | PE | 3 | 0 | 0 | 45 | 3 |
| 8 | U23ITV38 | Security and Privacy in Cloud | PE | 3 | 0 | 0 | 45 | 3 |

## VERTICALS – IV (CYBER SECURITY & DATA PRIVACY)

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITV41 | Digital and Mobile Forensics | PE | 3 | 0 | 0 | 45 | 3 |
| 2 | U23ITV42 | Internetworking with TCP/IP | PE | 3 | 0 | 0 | 45 | 3 |
| 3 | U23ITV43 | Ethical Hacking | PE | 3 | 0 | 0 | 45 | 3 |
| 4 | U23ITV44 | Modern Cryptography | PE | 3 | 0 | 0 | 45 | 3 |
| 5 | U23ITV45 | Cloud Security | PE | 3 | 0 | 0 | 45 | 3 |
| 6 | U23ITV46 | Cryptocurrency and Blockchain Technologies | PE | 3 | 0 | 0 | 45 | 3 |
| 7 | U23ITV16 | Social Network Security | PE | 3 | 0 | 0 | 45 | 3 |
| 8 | U23ITV47 | Malware Analysis | PE | 3 | 0 | 0 | 45 | 3 |

## VERTICALS – V (CREATIVE MEDIA)

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITV51 | Digital Marketing | PE | 3 | 0 | 0 | 45 | 3 |
| 2 | U23ITV52 | Multimedia and Animation | PE | 3 | 0 | 0 | 45 | 3 |
| 3 | U23ITV53 | Video Creation and Editing | PE | 3 | 0 | 0 | 45 | 3 |
| 4 | U23ITV24 | UI and UX Design | PE | 3 | 0 | 0 | 45 | 3 |
| 5 | U23ITV54 | Visual Effects | PE | 3 | 0 | 0 | 45 | 3 |
| 6 | U23ITV55 | Game Development | PE | 3 | 0 | 0 | 45 | 3 |
| 7 | U23ITV56 | Multimedia Data Compression and Storage | PE | 3 | 0 | 0 | 45 | 3 |
| 8 | U23ITV57 | Android Mobile Application Development | PE | 3 | 0 | 0 | 45 | 3 |

## VERTICALS – VI (EMERGING TECHNOLOGIES)

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITV61 | Knowledge Engineering | PE | 3 | 0 | 0 | 45 | 3 |
| 2 | U23ITV62 | Robotics Process Automation | PE | 3 | 0 | 0 | 45 | 3 |
| 3 | U23ITV63 | Quantum Computing | PE | 3 | 0 | 0 | 45 | 3 |
| 4 | U23ITV64 | Cyber Security | PE | 3 | 0 | 0 | 45 | 3 |
| 5 | U23ITV65 | Optimization Techniques | PE | 3 | 0 | 0 | 45 | 3 |
| 6 | U23ITV46 | Cryptocurrency and Blockchain Technologies | PE | 3 | 0 | 0 | 45 | 3 |
| 7 | U23ITV66 | 3D Printing and Design | PE | 3 | 0 | 0 | 45 | 3 |
| 8 | U23ITV67 | Game theory | PE | 3 | 0 | 0 | 45 | 3 |

## VERTICALS – VII (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U23ITV71 | Soft Computing | PE | 3 | 0 | 0 | 45 | 3 |
| 2 | U23ITV12 | Neural Networks and Deep Learning | PE | 3 | 0 | 0 | 45 | 3 |
| 3 | U23ITV14 | Text and Speech Analysis | PE | 3 | 0 | 0 | 45 | 3 |
| 4 | U23ITV72 | Augmented Reality/ Virtual Reality | PE | 3 | 0 | 0 | 45 | 3 |
| 5 | U23ITV65 | Optimization Techniques | PE | 3 | 0 | 0 | 45 | 3 |
| 6 | U23ITV73 | Cognitive Science | PE | 3 | 0 | 0 | 45 | 3 |
| 7 | U23ITV74 | Ethics and AI | PE | 3 | 0 | 0 | 45 | 3 |
| 8 | U23ITV67 | Game theory | PE | 3 | 0 | 0 | 45 | 3 |

## OPEN ELECTIVES
## COMMON TO ALL BRANCHES EXCEPT INFORMATION TECHNOLOGY

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1 | U20OIT51 | Robotics and Intelligence System | OE | 3 | 0 | 0 | 45 | 3 |
| 2 | U20OIT52 | Smart Sensing | OE | 3 | 0 | 0 | 45 | 3 |
| 3 | U20OIT53 | Software Quality Assurance | OE | 3 | 0 | 0 | 45 | 3 |
| 4 | U20OIT54 | Information Storage Management | OE | 3 | 0 | 0 | 45 | 3 |
| 5 | U20OIT55 | Social Network Analysis | OE | 3 | 0 | 0 | 45 | 3 |
| 6 | U20OIT71 | Grid Computing | OE | 3 | 0 | 0 | 45 | 3 |
| 7 | U20OIT72 | Information Security | OE | 3 | 0 | 0 | 45 | 3 |
| 8 | U20OIT73 | Digital Image Processing | OE | 3 | 0 | 0 | 45 | 3 |
| 9 | U20OIT74 | Cyber Forensics | OE | 3 | 0 | 0 | 45 | 3 |
| 10 | U20OIT75 | Object Oriented Analysis and Design | OE | 3 | 0 | 0 | 45 | 3 |

## MINOR DEGREE ELECTIVE COURSES

| Sl. No. | COURSE CODE | COURSE TITLE | CATEGORY | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | |
| **THEORY** | | | | | | | | |
| 1. | U23ITM01 | Financial Management | ME | 3 | 0 | 0 | 45 | 3 |
| 2. | U23ITM02 | Fundamentals of Investment | ME | 3 | 0 | 0 | 45 | 3 |
| 3. | U23ITM03 | Banking, Financial Services and Insurance | ME | 3 | 0 | 0 | 45 | 3 |
| 4. | U23ITM04 | Introduction to Blockchain and its Applications | ME | 3 | 0 | 0 | 45 | 3 |
| 5. | U23ITM05 | Fintech Personal Finance and Payments | ME | 3 | 0 | 0 | 45 | 3 |
| 6. | U23ITM06 | Introduction to Fintech | ME | 3 | 0 | 0 | 45 | 3 |
| 7. | U23ITM07 | Foundations of Entrepreneurship | ME | 3 | 0 | 0 | 45 | 3 |
| 8. | U23ITM08 | Team Building & Leadership Management for Business | ME | 3 | 0 | 0 | 45 | 3 |
| 9. | U23ITM09 | Creativity & Innovation in Entrepreneurship | ME | 3 | 0 | 0 | 45 | 3 |
| 10. | U23ITM10 | Principles of Marketing Management for Business | ME | 3 | 0 | 0 | 45 | 3 |
| 11. | U23ITM11 | Human Resource Management for Entrepreneurs | ME | 3 | 0 | 0 | 45 | 3 |
| 12. | U23ITM12 | Financing New Business Ventures | ME | 3 | 0 | 0 | 45 | 3 |
| 13. | U23ITM13 | Principles of Public Administration | ME | 3 | 0 | 0 | 45 | 3 |
| 14. | U23ITM14 | Constitution of India | ME | 3 | 0 | 0 | 45 | 3 |
| 15. | U23ITM15 | Public Personnel Administration | ME | 3 | 0 | 0 | 45 | 3 |
| 16. | U23ITM16 | Administrative Theories | ME | 3 | 0 | 0 | 45 | 3 |
| 17. | U23ITM17 | Indian Administrative System | ME | 3 | 0 | 0 | 45 | 3 |
| 18. | U23ITM18 | Public Policy Administration | ME | 3 | 0 | 0 | 45 | 3 |
| 19. | U23ITM19 | Statistics for Management | ME | 3 | 0 | 0 | 45 | 3 |
| 20. | U23ITM20 | Datamining for Business Intelligence | ME | 3 | 0 | 0 | 45 | 3 |
| 21. | U23ITM21 | Human Resource Analytics | ME | 3 | 0 | 0 | 45 | 3 |
| 22. | U23ITM22 | Marketing and Social Media Web Analytics | ME | 3 | 0 | 0 | 45 | 3 |
| 23. | U23ITM23 | Operation and Supply Chain Analytics | ME | 3 | 0 | 0 | 45 | 3 |
| 24. | U23ITM24 | Financial Analytics | ME | 3 | 0 | 0 | 45 | 3 |
| 25. | U23ITM25 | Sustainable Infrastructure Development | ME | 3 | 0 | 0 | 45 | 3 |
| 26. | U23ITM26 | Sustainable Agriculture and Environmental Management | ME | 3 | 0 | 0 | 45 | 3 |
| 27. | U23ITM27 | Sustainable Bio Materials | ME | 3 | 0 | 0 | 45 | 3 |
| 28. | U23ITM28 | Materials for Energy Sustainability | ME | 3 | 0 | 0 | 45 | 3 |
| 29. | U23ITM29 | Green Technology | ME | 3 | 0 | 0 | 45 | 3 |
| 30. | U23ITM30 | Environmental Quality Monitoring and Analysis | ME | 3 | 0 | 0 | 45 | 3 |
| 31. | U23ITM31 | Integrated Energy Planning for Sustainable Development | ME | 3 | 0 | 0 | 45 | 3 |
| 32. | U23ITM32 | Energy Efficiency for Sustainable Development | ME | 3 | 0 | 0 | 45 | 3 |

**SUMMARY**

| Sl. No. | Subject Area | Credits per semester | | | | | | | | Credits Total | Percentage % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | | |
| 1 | Humanities and Social Sciences (HMS) | 5 | 3 | - | 3 | - | - | 3 | - | 14 | **8.5** |
| 2 | Basic Sciences (BS) | 12 | 7 | 4 | - | - | - | - | - | 23 | **13.9** |
| 3 | Engineering Sciences (ES) | 5 | 6 | 3 | - | - | - | - | - | 14 | **8.5** |
| 4 | Professional Core (PC) | - | 5 | 15 | 19 | 10 | 13 | 8 | - | 70 | **42.4** |
| 5 | Professional Elective (PE) | - | - | - | - | 6 | 6 | 3 | 6 | 21 | **12.7** |
| 6 | Open Elective (OE) | - | - | - | - | 3 | 3 | - | - | 6 | **3.6** |
| 7 | Employability Enhancement Courses (EEC) | - | 2 | - | - | - | - | 5 | 10 | 17 | **10.3** |
| | **Total** | **22** | **23** | **22** | **22** | **19** | **22** | **19** | **16** | **165** | **100%** |

## SEMESTER I

| | | L | T | P | C |
|---|---|---|---|---|---|
| U23HST11 | COMMUNICATIVE ENGLISH (COMMON TO ALL B.E./ B.TECH. PROGRAMMES) | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To enhance students listening ability for academic and Professional purposes.
2. To learn to use basic grammatical structures in suitable contexts
3. To help students acquire the ability to speak effectively in English in real - life situations.
4. To help learners use language effectively in professional contexts.
5. To develop students' ability to read and write complex texts, summaries, articles, definitions, Paragraph user manuals.

**UNIT I INTRODUCTION TO EFFECTIVE COMMUNICATION 9**

Define communication. Kinds of communication. Quintessential of communication in technical progression. Key characteristics of an effective communicator- listening, attitude modification, way of response with appropriate language, tone modulation.

**Listening**- Listening to TV news, Guest lectures. Speaking- Answering the Questions.

**Reading** - Reading brochures and technical magazines (technical context), telephone messages / social media messages relevant to technical contexts and emails, **Writing**-Reading comprehension, Parts of Speech.

**UNIT II READING QUEST 9**

**Listening**- listening and responding to video lectures/talks. **Speaking**- Day today conversations. **Reading** –Edison of India-GD Naidu "The Great Inventor". **Writing-** Emails / Informal Letters - Inviting, Congratulating & Thanking, Punctuations.

**UNIT III LANGUAGE RESOURCE GROWS CRITICAL JUDGEMENT 9**

Listening- listening to specific task-focused audio tracks. Speaking- summary of Robert Frost "Stopping by woods on a snowy evening". Reading – Reading advertisements, gadget reviews; user manuals. Writing – Essay Writing: Analytical essay: Narrative Essay, Developing Hints, Usage of tenses in sentence formation. Voices.

**UNIT IV LANGUAGE IN LIFE SKILL 9**

**Listening**- Listening to speech of Great Scholars. Speaking- mechanics of presentation. **Reading** – Newspaper articles, power point presentation. **Writing** – Checklist, Jumbled Sentences - Rearrange the sentences in correct order, WH-Questions-Form questions by using statements, Prefixes and Suffixes.

**UNITV IMPROVING SPEAKING &READING 9**

**Listening-** listening to situational based dialogues; **Speaking-** Stating intention to do something- Expressing opinion-asking people to repeat themselves**. Reading** – Summary of O.Henry's "The last Leaf". **Writing** – Dialogue Writing.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to:

**CO1:** Remember appropriate words in a situational conversation.
**CO2:** Gain understanding of basic grammatical structures and use them in right context.
**CO3:** Read and infer the denotative and connotative meanings of technical texts.
**CO4:** Write Dialogue, Letter and paragraphs on various topics.
**CO5:** Make the students prepare effective notes for main sources available.
**CO6:** Enhance them to give operational talk.

**TEXT BOOKS:**

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition).
2. English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.
3. The Gift of the Magi by O.Henry, McClure, Philips and company.

**REFERENCE BOOKS:**


1. Meenakshi Raman & Sangeeta Sharma, "Technical Communication – Principles and Practices", Oxford Univ. Press, 2016, New Delhi.
2. Lakshminarayanan, "A Course Book on Technical English", Scitech Publications (India) Pvt. Ltd.
3. Aysha Viswamohan, "English For Technical Communication (With CD)", Mcgraw Hill Education.
4. Kulbhusan Kumar, RS Salaria, "Effective Communication Skill", Khanna Publishing House.
5 Dr. V. Chellammal, "Learning to Communicate", Allied Publishing House, New Delhi, 2003.

| U23MAT12 | MATRICES AND CALCULUS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVES:**

The main learning objective of this course is to prepare the students for:

1. To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
2. To familiarize the students with differential calculus.
3. To familiarize the student with functions of several variables
4. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
5. To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems

**UNIT I MATRICES 12**

Introduction – Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley Hamilton theorem – Diagonalization of the matrices by Orthogonal Transformations – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

**UNIT II DIFFERENTIAL CALCULUS 12**

Limit of a function – Continuity – Derivatives – Differentiation rules – Implicit differentiation – Logarithmic differentiation – Maxima and Minima of functions of one variable.

**UNIT III MULTIVARIABLE CALCULUS 12**

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

**UNIT IV MULTIPLE INTEGRAL AND THEIR APPLICATIONS 12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

**UNIT V ORDINARY DIFFERENTIAL EQUATIONS 12**

Higher order linear differential equations with constant coefficients– Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients – Method of undetermined coefficients.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Use the matrix algebra methods for solving practical problems.

**CO2:** Use both the limit definition and rules of differentiation to differentiate functions.

**CO3:** Apply differential calculus tools in solving various application problems.

**CO4:** Able to use differential calculus ideas on several variable functions.

**CO5:** Apply multiple integral ideas in solving areas, volumes and other practical problems.

**CO6:** Solve the ordinary differential equations using different techniques for that model engineering problems.

**TEXT BOOKS:**


1. Kreyszig. E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal. B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].


**REFERENCE BOOKS:**


1. Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition,2016.
3. Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II, S.Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016
5. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.

| U23PHT13 | PHYSICS FOR ENGINEERS AND TECHNOLOGISTS (COMMON TO ALL B.E./ B.TECH. PROGRAMMES) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To make the students to gain the knowledge in elastics and plastic nature of the materials in the presence and absence of load.
2. To understand the students to know the application of the sound waves in different fields.
3. To motivate the students towards the applications of photo electric phenomena.
4. To know the physical principle of LASER, the working of LASER applications.
5. To understand the propagation of light in optical fibers and its applications.

**UNIT I ELASTICITY 9**

Introduction- Elasticity - plasticity– Hooke's law - relationship between three Modulii of elasticity (Qualitative) – stress & strain diagram and its uses -Poisson's ratio - factors affecting elasticity - twisting couple of wire - Torsion Pendulum: theory and experiment.

Beam: Internal bending moment – Cantilever: theory and experiment – Young's Modulus: uniform and non – uniform bending (Qualitative) – I-shaped girders- advantages and applications.

**UNIT II ULTRASONICS 9**

Introduction – classification of sound- properties of infrasonic, audible and ultrasonics - production: Magnetostriction and Piezoelectric methods – determination of velocity of sound in liquid (Acoustic Grating Method) – general applications – industrial application: Non - Destructive Testing: pulse echo system through transmission and reflection modes. ultrasonic scanning methods – medical application: sonogram.

**UNIT III MODERN PHYSICS 9**

Introduction –Black Body Radiation – Classical and Quantum Laws of Black Body Radiation - Photon and its Properties - Wave Particle Duality and Matter waves – De - Broglie Wavelength - Schrodinger's Time Independent and Time Dependent Wave Equations - Physical Significance of The Wave Function. Application: Particle in One Dimensional Box - Normalization Process – Photo Electric Effect – Laws Governing the Photoelectric Effect – Einstein's Formula - Derivation – Applications: Solar Cell – Solar Water Heater – Photo resistor (LDR).

**UNIT IV LASERS 9**

Lasers: Introduction - Properties of Laser-Spontaneous and Stimulated Emission Process - Einstein's Theory of Matter Radiation Interaction & A and B Coefficients; Amplification of Light By Population Inversion – Pumping Methods - Types of Lasers: Solid-State Laser (Homo And Hetero Junction Semiconductor Lasers), Gas Laser ($CO_2$), Applications: Laser Cutting and Welding, LIDAR and Barcode Scanner.

**UNIT V FIBER OPTICS AND APPLICATIONS 9**

Optical Fiber: Structure - advantages- Principle [TIR]–Propagation Phenomena in optical fiber - Expression for Acceptance Angle and Numerical Aperture – Relation between Refractive Index of Core, Numerical Aperture and Fractional Index Change – Fabrication: Double Crucible Method - Types: Material, Mode, Refractive Index - Applications: Optical Fiber Communication System – fiber optic sensors (Displacement and pressure sensors) – Medical Endoscope.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Differentiate the elastic and plastic nature of the materials.
**CO2:** Know the experimental techniques in both production and applications of ultrasonic waves.
**CO3:** Gain knowledge in the basics of quantum mechanics concepts.
**CO4:** Develop new devices based on LASER source.
**CO5:** Understand the advantages of optical fiber than metal wire.
**CO6:** Demonstrate some useful experiments based on optical fibre

**TEXT BOOKS:**


1. Dr. P. Mani, "Engineering Physics", Dhanam Publications, 2013.
2. Dr. G. Senthilkumar, "Engineering Physics", VRB Publishers, 2017.
3. K. Thyagarajan, Ajoy Ghatak, "Lasers Fundamentals and Applications" II nd Edition, Springer, 2010.
4. D.K. Bhattacharya, Poonam Tandon," Engineering Physics", Oxford HED Publishers, 2017.


**REFERENCE BOOKS:**


1. Marikani, "Engineering Physics", PHI, New Delhi, 2013.
2. Bhattacharya & Bhaskaran, "Engineering Physics", Oxford Publications, 2012.
3. R Murugeshan, Kiruthiga, Sivaprasath S, "Modern Physics", Chand Publishing, 2021.
4. S. Rajivgandhi & A. Ravikumar, "Engineering Physics I", RK Publications, 2023
5. Sathyaprakash, "Quantum Mechanics", Pragati Prakashan, Meerut, 2016.

| U23CYT14 | CHEMISTRY FOR ENGINEERING & TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

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

**UNIT I Water Treatment 9**

Water: Sources, impurities, Parameters. Types of water Hardness of water -types – expression of hardness – units – Estimation of hardness of water by EDTA. Desalination - Reverse Osmosis. Boiler troubles: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralisation and zeolite process.

**UNIT II Electro and Nano chemistry 9**

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf by Poggendorff's compensation principle. Single electrode potential – Nernst equation – reference electrodes -types–Calomel electrode - electrolysis of water.

Nanomaterials: Basics of Nano Chemistry: Distinction between molecules, nanomaterials and bulk materials. Preparation of nanomaterials- laser ablation method and Chemical Vapour Deposition (CVD). Application of Nanomaterials in medicine, agriculture, energy, electronics and catalysis.

**UNIT III Phase Rule and Composites 9**

Phase rule terms with examples. water system; Reduced phase rule Two component system: lead-silver system – Composites, Need, Constitution: Matrix materials, Applications and Reinforcement and applications of Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

**UNIT IV Fuels & Combustion 9**

Fuels –Classification-Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel.

Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. $CO_2$ emission and carbon foot print.

**UNITV Energy Sources and Storage devices 9**

Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy;

Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion- battery; Electric vehicles-working principles; Fuel cells: $H_2$-$O_2$ fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.

**CO2:** Apply the basic knowledge of Corrosion and various electrodes.

**CO3:** Know the economically and new methods of synthesis nano materials.

**CO4:** Apply the knowledge of phase rule and composites for material selection requirements.

**CO5:** Understand the concepts of suitable fuels for engineering processes and applications.

**CO6:** Have the knowledge of different forms of energy resources and apply them for suitable applications in energy sectors.

**TEXT BOOKS:**


1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.
4. J. Manivel , "Engineering Chemistry" R.K.Publishers, 1st Edition 2022.


**REFERENCE BOOKS:**


1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.

| U23GET15 | PROBLEM SOLVING AND PYTHON PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To understand the basics of algorithmic problem solving.
2. To learn to solve problems using Python conditionals and loops.
3. To define Python functions and use function calls to solve problems.
4. To use Python data structures - lists, tuples, dictionaries to represent complex data
5. To do input/output with files in Python.

**UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9+3**

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

**UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS 9+3**

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

**UNIT III CONTROL FLOW, FUNCTIONS, STRINGS 9+3**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, GCD, exponentiation, sum an array of numbers, linear search, binary search.

**UNIT IV LISTS, TUPLES, DICTIONARIES 9+3**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation

**UNITV FILES, MODULES, PACKAGES 9+3**

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Develop algorithmic solutions to simple computational problems
**CO2:** Develop and execute simple Python programs
**CO3:** Develop simple Python programs using conditionals and loops for solving problems
**CO4:** Explain the Concept of Files and exceptions
**CO5:** Develop simple Python programs for Read and write data from/to files in Python programs
**CO6.** Explain the concept of exceptions and handling

**TEXT BOOKS:**


1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017


**REFERENCE BOOKS:**


1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.

| U23BSP11 | PHYSICS AND CHEMISTRY LABORATORY (COMMON TO ALL B.E. / B.TECH. PROGRAMMES) | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 2 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To learn the proper use of various kinds of physics laboratory equipment.
2. To learn how data can be collected, presented and interpreted in a clear and concise manner.
3. To learn problem solving skills related to physics principles and interpretation of experimental data.
4. To determine error in experimental measurements and techniques used to minimize such error.
5. To make the student as an active participant in each part of all lab exercises.
6. To inculcate experimental skills to test basic understanding of water quality parameters, as, acidity, alkalinity, chloride.
7. To Induce the students to analyze the hardness of water
8. To induce the students to familiarize with electro analytical techniques such as, pH metry,
   conductometry in the determination of impurities in aqueous solutions.

**LIST OF EXPERIMENTS**

1. Torsion pendulum - Determination of rigidity modulus of wire and moment of inertia of regular disc.
2. Non - Uniform bending–Determination of Young's modulus.
3. Laser – (i) Determination of the wavelength of the laser using grating.
   (ii) Determination of size of the particles using laser source.
4. Air wedge – Determination of thickness of a thin sheet/wire.
5. Determination of Band gap of a semiconductor using PN junction kit.
6. To study the V-I Characteristics of Light Dependent Resistor (LDR).
7. Determination of types and amount of alkalinity in water sample.
8. Determination of total, temporary & permanent hardness of water by EDTA method.
9. Determination of chloride content of water sample by Argentometric method.
10. Determination of strength of given hydrochloric acid using pH meter.
11. Determination of strength of acids in a mixture of acids using conductivity meter.
12. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)

**TOTAL: 60 PERIODS**

## LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | Torsion pendulum set up (Metal Disc, Symmetrical Mass(2x100g), Stop Clock, Screw Gauge) | **5** |
| 2. | Non – Uniform bending set up (Travelling Microscope, Knife Edges, Weight Hanger with Mass(5x50g), Screw Gauge, Vernier Caliper, Meter Scale) | **5** |
| 3. | Laser set up (Semiconductor Laser, Screen, Grating Stand, Wooden Stand with Meter Scale) | **5** |
| 4. | Air wedge (Air Wedge Set Up, Travelling Microscope, Sodium Vapour Lamp, Transformer) | **5** |
| 5. | Band gap of a semiconductor (PN Junction Kit, Thermometer, Heater, Beaker, Oil) | **5** |
| 6. | Light Dependent Resistor (Power Suppy, Voltmeter, Ammeter, LDR, Bulb, Resistors) | **5** |
| 7. | PH meter | **5** |
| 8. | Conductivity meter | **10** |
| 9. | Common Apparatus (Pipette, Burette, Conical Flask, Porcelain tile, Dropper) | **15** |

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Understand the functioning of various physics laboratory equipment.

**CO2:** Observe and tabulate experimental data.

**CO3:** Solve problems individually and collaboratively.

**CO4:** Analyse the quality of water samples with respect to their acidity, alkalinity

**CO5:** Determine the amount of hardness in the water

**CO6:** Analyse quantitatively the impurities in solution by electro analytical techniques

| U23HSP12 | ENGLISH LABORATORY<br>(COMMON TO ALL B.E. / B.TECH. PROGRAMMES) | L<br>0 | T<br>0 | P<br>2 | C<br>1 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

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

**LIST OF EXPERIMENTS**

1. Listening for general information-specific details.
2. Conversation: Introduction to classmates.
3. Speaking - making telephone calls-Self Introduction.
4. Talking about current and temporary situations & permanent and regular situations.
5. Listening to podcasts, anecdotes / stories / event narration.
6. Event narration; documentaries and interviews with celebrities.
7. Events-Talking about current and temporary situations & permanent and regular situations.
8. Engaging in small talk.
9. Describing requirements and abilities- Picture description.
10. Discussing and making plans.
11. Talking about tasks- progress- positions -directions of movement.
12. Talking about travel preparations and transportation.
13. Listening to debates/ discussions.
14. Making prediction talking about a given topic.
15. Describing processes.

**TOTAL: 60 PERIODS**

## LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | Communication laboratory with sufficient computer systems | **30** |
| 2. | Server | **1** |
| 3. | Head phone | **30** |
| 4. | Audio mixture | **1** |
| 5. | Collar mike | **1** |
| 6. | Television | **1** |
| 7. | Speaker set with amplifier | **1** |
| 8. | Power point projector and screen | **1** |
| 9. | Cordless mike | **1** |

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Identify and comprehend complex academic texts.

**CO2:** Interpret accurately and fluently in formal and informal communicative contexts.

**CO3:** Demonstrate their opinions effectively in both oral and written medium of communication.

**CO4:** Plan travelogue and construct paragraphs on various aspects.

**CO5:** Develop journal reading skills and small talk.

**CO6:** Utilizing technical terms and making power point presentations.

| U23GEP13 | PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To understand the problem-solving approaches.
2. To learn the basic programming constructs in Python.
3. To practice various computing strategies for Python-based solutions to real world problems.
4. To use Python data structures - lists, tuples, dictionaries.
5. To do input/output with files in Python.
6. To understand the problem-solving approaches.

**LIST OF EXPERIMENTS**

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (Reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (Copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (Divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool. 12. Developing a game activity using Pygame like bouncing ball, car race etc.

**TOTAL: 60 PERIODS**

## LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse | 30 |
| 2. | Windows 10 or higher operating system / Linux Ubuntu 20 or higher | 30 |
| 3. | PyCharm / IDLE / Spyder / | 30 |

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Develop algorithmic solutions to simple computational problems.

**CO2:** Develop and execute simple Python programs

**CO3:** Build programs in Python using conditionals and loops for solving problems

**CO4:** Apply functions to decompose a Python program

**CO5:** Construct compound data using Python data structures

**CO6:** Utilize Python packages in developing software applications

## SEMESTER-II

| U23HST21 | PROFESSIONAL ENGLISH<br>(COMMON TO ALL B.E. / B.TECH. PROGRAMMES) | L<br>3 | T<br>0 | P<br>0 | C<br>3 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To engage learners in meaningful language activities to improve their reading and writing skills.
2. To learn various reading strategies and apply in comprehending documents in professional context.
3. To help learners understand the purpose, audience, contexts of different types of writing.
4. To enable students write letters and reports effectively in formal and business situations.
5. To demonstrate an understanding of job applications and interviews for internship and placements.

**UNIT I PREPARATORY DOCUMENTATIONS 9**

**Listening-** Listening to formal conversations and participating**. Speaking-** speaking about one's family. **Reading –** Summary of W.W Jacobs "The monkey's paw". **Writing –** Subject verb Agreement, Numerical -Adjectives, Kinds of sentences**,** Writing reviews (book / film), writing Instructions, Writing Recommendation.

**UNIT II LECTURA ENRICHMENT AND PASSAGE COMPOSE 9**

**Listening-** listening to lectures on academic topics; **Speaking-** Asking for and giving directions. **Reading -** Reading longer technical texts; **Writing -** Compound words, Homophones and Homonyms, Cause and Effect expressions. Essay Writing, Writing Letter to the Editor (complaint, acceptance, Requesting, Thanking).

**UNIT III ANALYTICAL SKILL 9**

**Listening-** Watching videos/documentaries and responding to questions based on them. **Speaking –**Speaking about ones favourite place**. Reading –** Summary of the poem – John keats "Ode to a Nightingale". **Writing-** Purpose statement, Extended Definitions. Writing Job/ Internship application – Cover letter & Resume.

**UNIT IV REPORT WRITING 9**

**Listening-** Listening to class room lectures/talks on engineering/technology. **Speaking–** Introduction to technical presentations. **Reading –** Newspaper articles; **Writing –** Comparative Adjectives Direct and Indirect speech**.** Report Writing- Fire Accident Report, Road Accident, Feasibility Report).

**UNITV ENABLING LINGUA IDEALITY & INFORMATION 9**

**Listening -** TED/ Ink talks. **Speaking –** Making presentation on a given topic. **Reading –** Company profiles, Statement of Purpose, (SOP), **Writing –** Relative Clauses, If conditions, Cause and Effect. Chart Interpretations - Bar Chart, Pie Chart, Flow Chart & Tables.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Compare and contrast products and ideas in technical texts.
**CO2:** Identify cause and effects in events, industrial processes through technical texts.
**CO3:** Analyze problems in order to arrive at feasible solutions and communicate them orally and in the written format.
**CO4:** Motivate students to write reports and winning job applications.
**CO5:** Recall and comprehend different discourses and genres of texts.
**CO6:** Making the students to become virtuous presenters.

**TEXT BOOKS:**


1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021.
3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.


**REFERENCE BOOKS:**


1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

| U23MAT22 | STATISTICS AND NUMERICAL METHODS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. This course aims at providing the necessary basic concepts of a few statistical tools and give procedures for solving different kinds of problems occurring in engineering and technology.
2. To acquaint the knowledge of classifications of design of experiments in the field of agriculture.
3. To introduce the basic concepts of solving algebraic and transcendental equations.
4. To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
5. To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

**UNIT I TESTING OF HYPOTHESIS 12**

Introduction – Sampling distributions – Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

**UNIT II DESIGN OF EXPERIMENTS 12**

Introduction – Analysis of variance – One way and two way classifications – Completely randomized design – Randomized block design – Latin square design.

**UNIT III SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 12**

Solution of algebraic and transcendental equations – Fixed point iteration method – Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigen Value of a matrices by power method and jacobi's method for Symmetric matrices.

**UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION 12**

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

**UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 12**

Single step methods: Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge – Kutta method for solving first order differential equations – Multi step methods : Milne's and Adams Bashforth predictor corrector methods for solving first order differential equations.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

- **CO1:** Apply the concept of testing of hypothesis for small and large samples in real life problems.
- **CO2:** Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- **CO3:** Solve the algebraic and transcendental equations.
- **CO4:** Understand the knowledge of numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
- **CO5:** Solve the ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.
- **CO6:** Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

**TEXT BOOKS:**


1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson , R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.


**REFERENCE BOOKS:**


1. Burden,R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi,12th Edition, 2020.
5. Spiegel. M.R., Schiller.J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.

| U23PHT25 | PHYSICS FOR INFORMATION SCIENCES<br>(COMMON TO CSE, IT AND AIDS PROGRAMMES) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To make the students to understand the basics of crystallography and its importance in studying materials properties.
2. To instill knowledge on physics of semiconductors, determination of charge carriersand device applications.
3. To inculcate an idea of significance of new materials, nanostructures ensuing nano device applications.

**UNIT I CONDENSED MATTER PHYSICS 9**

Introduction - Lattice - Unit Cell - Seven Crystal Systems -Bravai's Lattices - Lattice Planes - Calculation of Number of Atoms per Unit Cell, Atomic Radius, Coordination Number and Packing Factor for SC, BCC, FCC and HCP Structures. Miller Indices – Derivation for Inter-Planar Spacing in terms of Miller Indices-Crystal Growth Techniques: Melt Growth Technique (Bridgman and Czochralski Techniques).

**UNIT II PHYSICS OF SEMICONDUCTOR 9**

Introduction – Properties - Intrinsic Semiconductors – Energy Band Diagram – Direct and Indirect Band Gap Semiconductors – Carrier Concentration in Intrinsic Semiconductors – Extrinsic Semiconductors - Carrier Concentration in N-Type & P-Type Semiconductors – Variation of Carrier Concentration with Temperature – Carrier Transport in Semiconductors: Drift, Mobility And Diffusion – Hall Effect And Devices.

**UNIT III MODERN ENGINEERING MATERIALS 9**

Shape Memory Alloys – Structures – Properties – Applications. Metallic Glasses – Preparation and Applications. Ceramics – Types - Properties and Applications.

Nanomaterials – Types – Properties and Applications – Preparation Techniques: Electrodeposition – Pulsed Laser Deposition. CNT – Structure – Types – Properties - Applications

**UNIT IV OPTOELECTRONICS AND DEVICES 9**

Classification of optical materials-Light detectors and solor cells – Light emitting diode- Laser diode- optical process in organic semiconductor device-Excitonic state – Electro-optics and nonlinear optics; Modulator and Switching devices-plasmonics-Applications of opto electronics devices.

**UNIT V DIELCTRIC MATERIALS 9**

Fundamental definitions – polarization: types – polarizability calculation – frequency and temperature dependence of polarization – internal electric field and Clausius – Mosotti relation – dielectric breakdown: types, characteristics and remedies.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Know basics of crystallography and its importance for varied materials properties.

**CO2:** Acquire knowledge on basics of semiconductor physics and its applications in various devices.

**CO3:** Illustrate the SMA and metallic glasses.

**CO4:** Understand the optical properties of materials and working principles of various optical devices

**CO5:** Explain types of polarization and its mathematical expression

**CO6:** Classify the various types of dielectric breakdown based on materials

**TEXT BOOKS:**


1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2. G.W.Hanson. Fundamentals of Nanoelectronics. Pearson Education (Indian Edition), 2009.
3. Dr. P. Mani, "Physics for Electronics Engineering" Dhanam Publications, 2017.
4. Dr. G. Senthilkumar, "Engineering Physics II" VRB Publishers, 2013.
5. Theraja .B.L., Basic electronics solid state, S.Chand and Company Ltd (2002).


**REFERENCE BOOKS:**


1. R.Balasubramaniam, Callister's Materials Science and Engineering. Wiley (Indian Edition), 2014.
2. Robert F.Pierret, Semiconductor Device Fundamentals, Pearson, 2006.
3. Dr. G. Senthilkumar, A. Ravikumar & S. Rajivgandhi, " Engineering Physics II", VRB Publishers, 2023
4. Ben Rogers, Jesse Adams and Sumita Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2017.
5. Kasap.S.O"Principlesof Electronic materials and Devices.;McGraw-Hill education, 2007.
6. S. O. Pillai, "Solid State Physics", New Age International, New Delhi, 1995.

| U23EET23 | BASIC ELECTRICAL AND ELECTRONICS ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

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

**UNIT I ELECTRICAL CIRCUITS 9**

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state)

Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)

**UNIT II ELECTRICAL MACHINES 9**

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor

**UNIT III ANALOG ELECTRONICS 9**

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon & Germanium – PN Junction Diodes, Zener Diode – Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET,IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters

**UNIT IV DIGITAL ELECTRONICS 9**

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions - SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only)

**UNITV MEASUREMENTS AND INSTRUMENTATION 9**

Functional elements of an instrument, Standards and calibration, Operating Principle, types – Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers - CT and PT, DSO - Block diagram - Data acquisition.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Compute the electric circuit parameters for simple problems
**CO2:** Explain the working principle of electrical machines
**CO3:** Explain the applications of electrical machines
**CO4:** Analyze the characteristics of analog electronic devices
**CO5:** Explain the basic concepts of digital electronics
**CO6:** Explain the operating principles of measuring instruments

**TEXT BOOKS:**


1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020
2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008.
4. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.


**REFERENCE BOOKS:**


1. Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.
2. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
3. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
5. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

| U23ECT23 | DIGITAL PRINCIPLES AND SYSTEM DESIGN | L | T | P | C |
|---|---|---|---|---|---|
| | | 4 | 0 | 0 | 4 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To design digital circuits using simplified Boolean functions
2. To analyze and design combinational circuits
3. To analyze and design synchronous and asynchronous sequential circuits
4. To understand Programmable Logic Devices
5. To write HDL code for combinational and sequential circuits

**UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 12**

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates – NAND and NOR Implementations.

**UNIT II COMBINATIONAL LOGIC 12**

Combinational Circuits – Analysis and Design Procedures – Binary Adder– Subtractor – Decimal Adder– Magnitude Comparator– Decoders – Encoders – Multiplexers – Demultiplexer.

**UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 12**

Sequential circuits: Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables – Triggering of FF – Registers and Counters – Design of Counters – Ripple Counter – Ring Counters – Shift registers – Universal Shift Register.

**UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 12**

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race free State Assignment – Hazards – Essential Hazards– Design of Hazard free circuits.

**UNIT V MEMORY AND PROGRAMMABLE LOGIC 12**

RAM – Memory Decoding – Memory Expansion – ROM – PROM – EPROM – EEPROM – Programmable Logic Devices– Programmable Logic Array.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Simplify Boolean functions using KMap
**CO2:** Design and Analyze Combinational and Synchronous Sequential Circuits.
**CO3:** Design and Analyze
**CO4:** Write HDL code for combinational and Sequential Circuits
**CO5:** Implement the different memory management.
**CO6:** Implement designs using Programmable Logic Devices

**TEXT BOOKS:**


1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog", 6th Edition, Pearson Education, 2017.
2. G. K. Kharate, Digital Electronics, Oxford University Press, 2010


**REFERENCE BOOKS:**


1. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, PearsonEducation, 2017.
2. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
3. Donald D. Givone, Digital Principles and Design, Tata Mc Graw Hill, 2003.

| U23CST21 | PROGRAMMING IN C | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To understand the constructs of C Language.
2. To develop C Programs using basic programming constructs
3. To develop C programs using arrays and strings
4. To develop modular applications in C using functions
5. To develop applications in C using pointers and structures

**UNIT I BASICS OF C PROGRAMMING 9**

Introduction to programming paradigms – Applications of C Language - Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process

**UNIT II ARRAYS AND STRINGS 9**

Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

**UNIT III FUNCTIONS AND POINTERS 9**

Shape Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions –Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

**UNIT IV STRUCTURES AND UNION 9**

Structure - Nested structures – Pointer and Structures – Array of structures – Self-referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility.

**UNIT V FILE PROCESSING 9**

Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Demonstrate knowledge on C Programming constructs
**CO2:** Design and implement applications using arrays and strings
**CO3:** Develop and implement modular applications in C using functions and pointers
**CO4:** Develop applications in C using structures and unions
**CO5:** Design applications using sequential and random-access file processing.
**CO6:** Explain the concept of Command line arguments

**TEXT BOOKS:**


1. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.


**REFERENCE BOOKS:**


1. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020
3. Byron S. Gottfried, “Schaum’s Outline of Theory and Problems of Programming with C”, McGraw-Hill Education, 1996
4. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013
5. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1st Edition, Pearson Education, 2013.

| U23CSP21 | PROGRAMMING IN C LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To familiarise with C programming constructs.
2. To develop programs in C using basic constructs.
3. To develop programs in C using arrays.
4. To develop applications in C using strings, pointers, functions.
5. To develop applications in C using structures.
6. To develop applications in C using file processing

**LIST OF EXPERIMENTS**

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

**TOTAL: 60 PERIODS**

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse | 30 |
| 2. | Windows 10 or higher operating system / Linux Ubuntu 20 or higher | 30 |
| 3. | Dev C / Eclipse CDT / Code Blocks / CodeLite / equivalent open source IDE | 30 |

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1 :** Demonstrate knowledge on C programming constructs.
**CO2 :** Develop programs in C using basic constructs
**CO3:** Construct programs in C using arrays.
**CO4:** Develop applications in C using strings, pointers, functions
**CO5:** Build applications in C using structures.
**CO6:** Develop applications in C using file processing

| U23HSP22 | COMMUNICATION LABORATORY (COMMON TO ALL B.E. / B.TECH. PROGRAMMES) | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 2 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
2. To be able to communicate effectively through writing.
3. Encouraging plan designing and decision making.
4. Understanding and writing technical instruction.
5. To understand the value of letter writing with correct format.

**LIST OF EXPERIMENTS:**

1. Speaking-Role Play Exercises Based on Workplace Contexts.
2. Talking about competition.
3. Discussing progress toward goals-talking about experiences.
4. Discussing likes and dislikes.
5. Discussing feelings about experiences.
6. Discussing imaginary scenarios.
7. Writing short essays.
8. Speaking about the natural environment.
9. Describing communication system.
10. Describing position and movement- explaining rules.
11. Understanding technical instructions-Writing: writing instructions.
12. Speaking: describing things relatively-describing clothing.
13. Discussing safety issues (making recommendations) talking about electrical devices.
14. Describing controlling actions.
15. Writing a job application (Cover letter + Resume).

**TOTAL: 60 PERIODS**

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | Communication laboratory with sufficient computer systems | **30** |
| 2. | Server | **1** |
| 3. | Head phone | **30** |
| 4. | Audio mixture | **1** |
| 5. | Collar mike | **1** |
| 6. | Television | **1** |
| 7. | Speaker set with amplifier | **1** |
| 8. | Power point projector and screen | **1** |
| 9. | Cordless mike | **1** |

**COURSE OUTCOMES:**

At the end of the course the students would be able to:

- **CO1 :** Distinguish their technical competency through language skill.
- **CO2 :** Predict context effectively in-group discussions held in a formal / semi-formal discussions.
- **CO3:** Understanding candidates' key characteristics.
- **CO4:** Finding personality traits by sharing and comparing thoughts and ability.
- **CO5:** Understanding the value of ethics (rules and regulations).
- **CO6:** Construct emails and effective job applications**.**

## SEMESTER III

| U23ITT31 | COMPUTER ORGANIZATION AND ARCHITECTURE | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To make students understand the basic structure and operation of digital computer.
2. To understand the hardware-software interface.
3. To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
4. To familiarize the students with hierarchical memory system including cache memories and Virtual memory.

**UNIT I OVERVIEW & INSTRUCTIONS 9**

Eight ideas – Components of a computer system – Technology – Performance – Power wall –Uni processors to multiprocessors; Instructions – operations and operands – representing instructions– Logical operations – control operations – Addressing and addressing modes

**UNIT II ARITHMETIC OPERATIONS 9**

ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Sub word Parallelism.

**UNIT III PROCESSOR AND CONTROL UNIT 9**

Basic MIPS implementation – Building data path – Control Implementation scheme – Pipelining –Pipelined data path and control – Handling Data hazards & Control hazards – Exceptions.

**UNIT IV PARALLELISM 9**

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors

**UNIT V MEMORY AND I/O SYSTEMS 9**

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Understand the basics structure of computers, operations and instructions
**CO2:** Explain the design concepts of arithmetic and logic unit
**CO3:** Apply pipelined control units and the different types of hazards in the instructions
**CO4:** Interpret the concepts of parallel processing architectures
**CO5:** Summarize the fundamentals of memory system
**CO6:** Explain the concepts of I/O system

**TEXT BOOKS:**


1. David A. Patterson and John L. Hennessey, “Computer organization and design, MorganKauffman Elsevier, Fifth edition, 2014.
2. Structured Computer Organization, Andrew S.Tanenbaum “Structured Computer Organization”sixth Edition 2021.


**REFERENCE BOOKS:**


1. Carl Hamacher. V, Zvonko G. Varanesic and Safat G. Zaky, “Computer Organization “, 6th edition,Mc Graw-Hill Inc, 2012.
2. William Stallings “Computer Organization and Architecture”, 11th Edition, Pearson Education, 2006.
3. Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, 2nd Edition, PearsonEducation, 2005.
4 Govindarajalu, “Computer Architecture and Organization, Design Principles and Applications",1st edition, Tata McGraw Hill, New Delhi, 2005.

| U23ITT32 | DATA STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To understand the concepts of ADTs
2. To Learn linear data structures – lists, stacks, and queues
3. To understand sorting, searching and hashing algorithms
4. To apply Tree and Graph structures

**UNIT I INTRODUCTION AND LINEAR DATA STRUCTURE – LIST 9**

Introduction to Data structure, 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 – Radix Sort – Multilists.

**UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 9**

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue - deQueue – applications of queues

**UNIT III NON-LINEAR DATA STRUCTURES – TREES 9**

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT – Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree - Heap – Applications of heap.

**UNIT IV NON-LINEAR DATA STRUCTURES - GRAPHS 9**

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

**UNITV SEARCHING, SORTING AND HASHING TECHNIQUES 9**

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

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Describe linear data structures using array and linked list.
**CO2:** Apply various operations like stacks, queues in linear data structure.
**CO3:** Demonstrate non-linear data structures tree and its application.
**CO4:** Apply various algorithms and operations in graph
**CO5:** Apply searching, sorting and hashing techniques in data structures.
**CO6:** Interpret sorting algorithms for a given problem.

**TEXT BOOKS:**


1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 1997.
2. Reema Thareja, “Data Structures Using C”, Second Edition, Oxford University Press, 2011.


**REFERENCE BOOKS:**


1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, “Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education,1983.
3. Stephen G. Kochan, “Programming in C”, 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008

| U23ITT33 | DATABASE MANAGEMENT SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To learn the fundamentals of data models, relational algebra and SQL
2. To represent a database system using ER diagrams and to learn normalization techniques
3. To understand the fundamental concepts of transaction, concurrency and recovery processing
4. To understand the internal storage structures using different file and indexing techniques which will help in physical DB design
5. To have an introductory knowledge about the Distributed databases, NOSQL and database security
6. To implement important commands and SQL Queries and the usage of nested and joint queries

**UNIT I RELATIONAL DATABASES** **9**

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL .

**UNIT II DATABASE DESIGN** **9**

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

**UNIT III TRANSACTIONS** **9**

Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control –Two Phase Locking- Timestamp – Multi version – Validation and Snapshot isolation– Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging.

**UNIT IV IMPLEMENTATION TECHNIQUES** **9**

RAID – File Organization – Organization of Records in Files – Data dictionary Storage – Column Oriented Storage– Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for Selection, Sorting and join operations.

**UNITV ADVANCED TOPICS** **9**

Distributed Databases: Architecture, Data Storage, Transaction Processing, Query processing and optimization – NOSQL Databases: Introduction – CAP Theorem – Document Based systems – Key value Stores – Column Based Systems – Graph Databases. Database Security: Security issues – Access control based on privileges – Role Based access control.

**TOTAL:45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

- **CO1 :** Construct SQL Queries using relational algebra.
- **CO2 :** Design database using ER model and normalize the database
- **CO3:** Construct queries to handle transaction processing and maintain consistency of the database
- **CO4:** Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database
- **CO5:** Outline the various storage and optimization techniques.
- **CO6:** Explain the different advanced databases.

**TEXT BOOKS:**


1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017


**REFERENCE BOOKS:**


1. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

| U23ITT34 | OBJECT ORIENTED PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

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

**UNIT I INTRODUCTION TO OOP AND JAVA 9**

Overview of OOP – Object oriented programming paradigms – Features of Object-Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods -Access specifiers - Static members- JavaDoc comments

**UNIT II INHERITANCE, PACKAGES AND INTERFACES 9**

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

**UNIT III EXCEPTION HANDLING AND MULTITHREADING 9**

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication- Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing

**UNIT IV I/O, GENERICS, STRING HANDLING 9**

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

**UNIT V JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS 9**

JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus – Basics – Menu – Menu bars – Menu Item.

**TOTAL:45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

- **CO1:** Apply the concepts of classes and objects to solve simple problems
- **CO2:** Develop programs using inheritance, packages and interfaces.
- **CO3:** Make use of exception handling mechanisms and multithreaded model to solve real world problems
- **CO4:** Build Java applications with I/O packages, string classes, Collections and generics concepts
- **CO5:** Integrate the concepts of event handling
- **CO6:** Integrate JavaFX components and controls for developing GUI based applications

**TEXT BOOKS:**


1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi,2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015


**REFERENCE BOOKS:**


1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018.

| U23ITP31 | OBJECT ORIENTED PROGRAMMING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

## COURSE OBJECTIVES

The main learning objective of this course is to prepare the students for:

1. To build software development skills using java programming for real-world applications.
2. To understand and apply the concepts of classes, packages, interfaces, inheritance, exception handling and file processing.
3. To develop applications using generic programming and event handling.

## LIST OF EXPERIMENTS

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

**TOTAL: 60 PERIODS**

## LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | Personal Computer | **30** |
| 2. | Software: C / C++ / Equivalent complier | **30** |

## COURSE OUTCOMES:

At the end of the course the students would be able to

- **CO1:** Design and develop java programs using object-oriented programming concepts
- **CO2:** Design Interfaces and develop application using Interfaces
- **CO3:** Develop simple applications using object-oriented concepts such as package, exceptions
- **CO4:** Implement multithreading, and generics concepts
- **CO5:** Create GUIs and event driven programming applications for real world problems
- **CO6:** Develop applications using generic programming and event handlings.

| U23ITP32 | DATA STRUCTURES LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
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**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To implement Linear and Non – Linear Data Structures
2. To understand the different Operations of Search Trees
3. To implement Graph Traversal Algorithms
4. To get familiarized to Sorting and Searching Algorithms.

**LIST OF EXPERIMENTS**

1. Array implementation of Stack and Queue ADTs
2. Array implementation of List ADT
3. Linked list implementation of List, Stack and Queue ADTs
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
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
14. Hashing – any two collision techniques.

**TOTAL: 60 PERIODS**

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | **Personal Computer** | **30** |
| 2. | **Software: C / C++ Equivalent complier** | **30** |

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Develop and array implement of Stack and Queue ADTs
**CO2:** Develop and array implement of List ADT
**CO3:** Develop and implement List, Stack and Queue ADTs.
**CO4:** Apply the concept of Binary Trees , Binary Search Trees, AVL Trees
**CO5:** Develop and implement Heaps using Priority Queues
**CO6:** Apply the concept of searching and sorting algorithms

| U23ITP33 | DATABASE MANAGEMENT SYSTEM LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
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**COURSE OBJECTIVES**

The main learning objective of this course is to:

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

**LIST OF EXPERIMENTS**

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

a) Inventory Management for a EMart Grocery Shop
b) Society Financial Management c) Cop
Friendly App – Eseva
d) Property Management – eMall
e) Star Small and Medium Banking and Finance

- Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
- Apply Normalization rules in designing the tables in scope.
- Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features.
- Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
- Ability to showcase ACID Properties with sample queries with appropriate settings

**TOTAL: 60 PERIODS**

## LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | Personal Computer | **30** |
| 2. | Software: MYSQL/ Oracle RDBMS and Equivalent complier | **30** |

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Utilize typical data definitions and manipulation commands
**CO2:** Develop applications to test Nested and Join Queries
**CO3:** Build simple applications using Views
**CO4:** Build Procedures and Functions
**CO5:** Develop and manipulate data using NOSQL database.
**CO6:** Develop applications that require a Front-end Tool

| U23MAT32 | DISCRETE MATHEMATICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVES**

The Main learning objective of this course is to prepare the students for

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

**UNIT I LOGIC AND PROOFS 9**

Propositional logic – Propositional equivalences – Predicates and quantifiers – Nested quantifiers – Rules of inference – Introduction to proofs – Proof methods and strategy.

**UNIT II COMBINATORICS 9**

Mathematical induction – Strong induction and well ordering – The basics of counting– The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

**UNIT III GRAPHS 9**

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

**UNIT IV ALGEBRAIC STRUCTURES 9**

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.

**UNIT V LATTICES AND BOOLEAN ALGEBRA 9**

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra – Sub Boolean Algebra – Boolean Homomorphism.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Explain the concept of elementary mathematical logical arguments.
**CO2 :** Apply basic counting techniques to solve combinatorial problems.
**CO3:** Identify the applications of Graph theory models and data structures.
**CO4:** Explain the concepts and properties of algebraic structures such as groups, rings and fields.
**CO5:** Extend the concepts of Boolean algebra in the area of lattices.
**CO6:** Apply the knowledge of argumental discrete mathematical problems.

**TEXT BOOKS:**


1. Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2. Tremblay. J.P .and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.


**REFERENCE BOOKS:**


1. Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction",5th Edition , Pearson Education Asia , Delhi , 2013.
2. Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

## SEMESTER IV

| U23ITT41 | DESIGN AND ANALYSIS OF ALGORITHMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 4 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To understand and apply the algorithm analysis techniques on searching and sorting algorithms
2. To critically analyze the efficiency of graph algorithms
3. To understand different algorithm design techniques
4. To solve programming problems using state space tree
5. To understand the concepts behind NP Completeness, Approximation algorithms and randomized algorithms.

**UNIT I INTRODUCTION 12**

Algorithm analysis: Time and space complexity - Asymptotic Notations and its properties Best case, Worst case and average case analysis – Recurrence relation: substitution method - Lower bounds – searching: linear search, binary search and Interpolation Search, Pattern search: The naïve string- matching algorithm - Rabin-Karp algorithm - Knuth-Morris-Pratt algorithm. Sorting: Insertion sort – heap sort.

**UNIT II GRAPH ALGORITHMS 12**

Graph algorithms: Representations of graphs - Graph traversal: DFS – BFS - applications - Connectivity, strong connectivity, bi-connectivity - Minimum spanning tree: Kruskal‘s and Prim‘s algorithm- Shortest path: Bellman-Ford algorithm - Dijkstra‘s algorithm - Floyd-Warshall algorithm Network flow: Flow networks - Ford-Fulkerson method – Matching: Maximum bipartite matching.

**UNIT III ALGORITHM DESIGN TECHNIQUES 12**

Divide and Conquer methodology: Finding maximum and minimum - Merge sort - Quick sort Dynamic programming: Elements of dynamic programming — Matrix-chain multiplication - Multi stage graph — Optimal Binary Search Trees. Greedy Technique: Elements of the greedy strategy - Activity-selection problem – Optimal Merge pattern — Huffman Trees

**UNIT IV STATE SPACE SEARCH ALGORITHMS 12**

Backtracking: n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem – Graph colouring problem Branch and Bound: Solving 15-Puzzle problem - Assignment problem – Knapsack Problem - Travelling Salesman Problem

**UNIT V NP-COMPLETE AND APPROXIMATION ALGORITHM 12**

Tractable and intractable problems: Polynomial time algorithms – Venn diagram representation - NP-algorithms - NP-hardness and NP-completeness – Bin Packing problem - Problem reduction: TSP – 3 - CNF problem. Approximation Algorithms: TSP - Randomized Algorithms: concept and application - primality testing - randomized quick sort - Finding $k^{th}$ smallest number.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Analyze the efficiency of algorithms using various frameworks
**CO2:** Apply graph algorithms to solve problems and analyze their efficiency.
**CO3:** Make use of algorithm design techniques like divide and conquer, dynamic programming and greedy techniques to solve problems.
**CO4:** Make use of state space tree method for solving problems.
**CO5:** Solve problems using approximation algorithms and randomized algorithms.
**CO6.** Understand the concept of NP, NP- Complete and NP Hard Problems

**TEXT BOOKS:**


1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India, 2009.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran – Computer Algorithms / C++‖ Orient Blackswan, 2nd Edition, 2019.


**REFERENCE BOOKS:**


1. Anany Levitin, –Introduction to the Design and Analysis of Algorithms‖, 3rd Edition, Pearson Education, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Reprint Edition, Pearson Education, 2006.
3. S. Sridhar, –Design and Analysis of Algorithms‖, Oxford university press, 2014.

| U23ITT42 | OPERATING SYSTEM | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To understand the basics and functions of operating systems.
2. To understand processes and threads.
3. To analyze scheduling algorithms and process synchronization.
4. To understand the concept of deadlocks.
5. To analyze various memory management schemes.
6. To be familiar with I/O management and file systems.
7. To be familiar with the basics of virtual machines and Mobile OS like iOS and Android.

**UNIT I INTRODUCTION 7**

Computer System - Elements and organization; Operating System Overview - Objectives and Functions - Evolution of Operating System; Operating System Structures – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.

**UNIT II PROCESS MANAGEMENT 11**

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling, Threads - overview Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlocks.

**UNIT III MEMORY MANAGEMENT 10**

Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.

**UNIT IV STORAGE MANAGEMENT 10**

Mass Storage Structure- Overview, Disk Scheduling and Management; File System Storage-File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation- File System Structure, Directory Structure, Allocation Methods, Free Space Management, I/O Systems.

**UNIT V VIRTUAL MACHINES AND MOBILE OS 7**

Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Explain the overall view of the computer system and operating system
**CO2 :** Apply various scheduling algorithm to avoid and prevent deadlock
**CO3:** Compare and contrast various memory management schemes
**CO4:** Explain the functionality of file systems, I/O systems, and Virtualization.
**CO5:** Understand the building blocks of virtual machines and explain the virtualization
**CO6:** Compare iOS and Android OS

**TEXT BOOKS:**


1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 10th Edition, John Wiley and Sons Inc., 2018.
2. Manish Kumar Singh, Sachin Kumar, Saibal Kumar pal "Operating Systems Concept building and problem-solving approach", 1st Edition, 2022, India.


**REFERENCE BOOKS:**


1. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022, New Delhi.
2. Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, Tata McGraw Hill Edition, 2010.
3. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
4. Achyut S. Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016.

| U23ITT43 | WEB TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To comprehend and analyze the basic concepts of web programming and internet protocols.
2. To describe how the client-server model of Internet programming works.
3. To demonstrate the uses of scripting languages
4. To practice server-side programming features – PHP, JSP.
5. To be familiar with database applications

**UNIT I WEBSITE BASICS 9**

Internet Overview - Fundamental computer network concepts - Web Protocols - URL – Domain Name- Web Browsers and Web Servers- Working principle of a Website –Creating a Website - Client-side and server-side scripting.

**UNIT II WEB DESIGNING 9**

HTML – Form Elements - Input types and Media elements - CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface.

**UNIT III CLIENT-SIDE PROCESSING AND SCRIPTING 9**

JavaScript Introduction – Variables and Data Types-Statements – Operators - Literals-Functions Objects-Arrays-Built-in Objects- Regular Expression, Exceptions, Event handling, Validation - JavaScript Debuggers.

**UNIT IV TYPESCRIPT 9**

Introduction of TypeScript, TypeScript Basics, Data types and variables, Destructuring and spread, Working with classes, working with interfaces, Generics, Modules and Name spaces, Ambients, Functions, Loops, Collections.

**UNIT V SERVLETS AND DATABASE CONNECTIVITY 9**

Servlets: Java Servlet Architecture – Servlet Life cycle- Form GET and POST actions -Sessions – Cookies – Database connectivity - JDBC Creation of simple interactive applications - Simple database applications.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Create simple Website by understand the basics
**CO2:** Apply HTML and CSS effectively to create interactive and dynamic websites
**CO3:** Build dynamic web pages with validation using Java Script objects and apply different event handling mechanisms
**CO4:** Demonstrate simple web pages using Typescript
**CO5:** Illustrate Servlets in web applications
**CO6:** Create simple database applications.

**TEXT BOOKS:**

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" 5th Edition, O'Reilly publishers, 2018.
2. Paul Deitel, Harvey Deitel, Abbey Deitel, “Internet & World Wide Web - How to Program”, 6th edition, Pearson Education, 2020.

**REFERENCE BOOKS:**

1. Jeffrey C. Jackson, "Web Technologies-A Computer Science Perspective", Pearson Education, 2007.
2. James F. Kurose, “Computer Networking: A Top-Down Approach”, 6th Edition, Pearson Education, 2012
3. Steven Holzemer, “PHP – The Complete Reference”, 1st Edition, Mc-Graw Hill, 2017
4. Fritz Schneider, Thomas Powell, “JavaScript - The Complete Reference”, 3rd Edition, McGraw Hill Publishers, 2017

| U23ITT44 | COMPUTER NETWORKS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To understand the protocol layering and physical level communication.
2. To analyze the performance of a network.
3. To understand the various components required to build different networks.
4. To learn the functions of network layer and the various routing protocols.
5. To familiarize the functions and protocols of the Transport layer and application layer

**UNIT I INTRODUCTION TO NETWORKS AND PHYSICAL LAYER 9**

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching

**UNIT II DATA-LINK LAYER & MEDIA ACCESS 9**

Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices

**UNIT III NETWORK LAYER 9**

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol

**UNIT IV TRANSPORT LAYER 9**

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol– Transmission Control Protocol – SCTP

**UNIT V APPLICATION LAYER 9**

WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Understand various layers of network and discuss the functions of physical layer.
**CO2:** Discuss how data flows from one node to another node with regard to data link layer.
**CO3:** Illustrate the performance of network layer
**CO4:** Explain the transport layer services and protocols.
**CO5:** Describe the working of various application layer protocols.
**CO6:** Describe different application layer protocols and their applicability based on user requirements.

**TEXT BOOKS:**


1. Behrouz A. Forouzan, “Data Communications and Networking with TCP/IP Protocol Suite”, Sixth Edition TMH, 2022.
2. Andrew S. Tanenbaum, Nick Feamaster, David J Wetherall,” Computer Networks”, Sixth Edition, Pearson Education 2021.


**REFERENCE BOOKS:**


1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, “Data and Computer Communications”, Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, “Computer and Communication Networks”, Second Edition, Prentice Hall, 2014. 4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open-Source Approach”, McGraw Hill, 2012.

| U23ITP41 | OPERATING SYSTEM LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To learn Unix commands and shell programming
2. To implement various CPU Scheduling Algorithms
3. To implement Process Creation and Inter Process Communication.
4. To implement Deadlock Avoidance and Deadlock Detection Algorithms
5. To implement Page Replacement Algorithms
6. To implement File Organization and File Allocation Strategies

**LIST OF EXPERIMENTS**

1. Basics of UNIX commands
2. Programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3. Programs to simulate UNIX commands like cp, ls, grep,etc.Shell Programming
4. Programs to implement the various CPU Scheduling Algorithms
5. Implementation of Semaphores
6. Implementation of Shared memory and IPC
7. Bankers Algorithm for Deadlock Avoidance
8. Implementation of Deadlock Detection Algorithm
9. Program to implement Threading & Synchronization Applications
10. Implementation of the following Memory Allocation Methods for fixed partition
    a) FirstFit b) WorstFit c) BestFit
11. Implementation of Paging Technique of Memory Management
12. Implementation of the following Page Replacement Algorithms
    a) FIFO b) LRU c) LFU
13. Implementation of the various File Organization Techniques
14. Implementation of the following File Allocation Strategies
    a) Sequential b) Indexed c) Linked

**TOTAL: 60 PERIODS**

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | Hardware: Standalone desktops | 30 |
| 2. | Software: C / C++ / Java / Equivalent complier | 30 |

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Illustrate the various CPU scheduling algorithms.
**CO2:** Apply deadlock avoidance and detection algorithms.
**CO3:** Implement semaphore concepts.
**CO4:** Create processes and implement IPC.
**CO5:** Analyze the performance of the various Page Replacement Algorithms
**CO6:** Implement File Organization and File Allocation Strategies

| U23ITP42 | COMPUTER NETWORKS LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To learn and use network commands.
2. To learn socket programming.
3. To implement and analyze various network protocols.
4. To learn and use simulation tools.
5. To use simulation tools to analyze the performance of various network protocols.

**LIST OF EXPERIMENTS**

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and trace route.
2. Capture ping and trace route PDUs using a network protocol analyzer and examine.
3. HTTP web client program to download a web page using TCP sockets.
4. Applications using TCP sockets: like
   - Echo client and echo server
   - Chat
   - File Transfer
5. Simulation of DNS using UDP sockets.
6. Code simulating ARP /RARP protocols.
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/UDP performance using Simulation tool.
9. Simulation of Distance Vector/ Link State Routing algorithm.
10. Performance evaluation of Routing protocols using Simulation tool.

**TOTAL: 60 PERIODS**

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | Hardware: Standalone desktops | 30 |
| 2. | Software: Network simulator like NS2/Glomosim/OPNET/ Packet Tracer /Equivalent | 30 |

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Implement various protocols using TCP and UDP.
**CO2:** Compare the performance of different transport layer protocols.
**CO3:** Use simulation tools to analyze the performance of various network protocols.
**CO4:** Analyze various routing algorithms.
**CO5:** Implement error correction codes
**CO6:** Explain Network simulator (NS) and Simulate Congestion Control Algorithms using NS.

| U23ITP43 | WEB TECHNOLOGY LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To design interactive web pages using Scripting languages.
2. To learn server-side programming using servlets and JSP.
3. To develop web pages using XML/XSLT.

**LIST OF EXPERIMENTS**

1. Create a web page with the following using HTML.
   - To embed an image map in a web page.
   - To fix the hot spots.
   - Show all the related information when the hot spots are clicked
2. Create a web page with all types of Cascading style sheets.
3. Client-Side Scripts for Validating Web Form Controls using DHTML.
4. Installation of Apache Tomcat web server.
5. Write programs in Java using Servlets:
   - To invoke servlets from HTML forms.
   - Session Tracking.
6. Write programs in Java to create three-tier applications using JSP and Databases
   - 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.
7. Programs using XML – Schema – XSLT/XSL.
8. Programs using DOM and SAX parsers.
9. Programs using AJAX.
10. Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Database.

**TOTAL: 60 PERIODS**

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| 1. | Hardware: Standalone desktops | 30 |
| 2. | Software: Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP | 30 |

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Design simple web pages using mark-up languages like HTML and CSS
**CO2:** Create dynamic web pages using DHTML and java script that is easy to navigate and use.
**CO3:** Develop Program server-side web pages that have to process request from client side web pages.
**CO4:** Develop web data using XML and web pages using JSP.
**CO5:** Understand various web services and how these web services interact.
**CO6:** Develop web service using real-world scenario

| U23GET41 | ENVIRONMENTAL SCIENCE AND SUSTAINABILITY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The main learning objective of this course is to prepare the students for:

1. To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
2. To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
3. To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them.
4. To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
5. To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

**UNIT I ENVIRONMENT AND BIODIVERSITY 9**

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

**UNIT II ENVIRONMENTAL POLLUTION 9**

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.

**UNIT III RENEWABLE SOURCES OF ENERGY 9**

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

**UNIT IV SUSTAINABILITY AND MANAGEMENT 9**

Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols- Climate change-Global, Regional and local environmental issues and possible solutions-case studies.

**UNIT V SUSTAINABILITY PRACTICES 9**

Zero waste and R concept, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles-carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio-economical and technological change.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students would be able to

**CO1:** Summarize the values, threats, conservation of biodiversity and ecosystems

**CO2:** Discuss the sources, effects, control measures of different types of pollution, and solid waste management

**CO3:** Associate the effects of exploitation of Natural resources on environment

**CO4:** Recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.

**CO5:** Demonstrate the knowledge of sustainability practices and identify green materials

**CO6:** Discuss scientific, technological, economic and social solutions using sustainable energy and green engineering

**TEXT BOOKS:**


1. R.K. Trivedi, ‗Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani,‗Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.


**REFERENCE BOOKS:**


1. Dharmendra S. Sengar, ‗Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007
2. Rajagopalan, R, ‗Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition,2015.
3. Erach Bharucha ―Textbook of Environmental Studies for Undergraduate Courses‖ Orient Blackswan Pvt.Ltd. 2013.