# RG 23

# CSE COURSE

# STRUCTURE & SYLLABUS

# BOOK

# RG 23

# CSE COURSE STRUCTURE

**GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY**
**(Autonomous)**
**Unit of USHODAYA EDUCATIONAL SOCIETY**
An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

## Vision

To evolve as a leading computer science and engineering centre producing competent technocrats to meet the demands of ever-changing industry and society.

## Mission

**DM1:** Imparting quality education through innovative teaching learning processes.

**DM2:** Motivating students to upgrade their technical expertise by promoting learner centric activities.

**DM3:** Inculcating ethical values and interpersonal skills in the learners.

**DM4:** upgrading knowledge in cutting edge technologies keeping pace with industrial standards.

## Program Educational Outcomes

**PEO1:** Outperform in professional career or higher learning by upgrading skills in Computer Science and Engineering stream

**PEO2:** Provide computing solutions for complex problems to meet industry demands and societal needs.

**PEO3:** Offer ethical, socially sensitive solutions as professionals and as entrepreneurs in Computer Science and other engineering disciplines.

**PEO4:** Leverage new computing technologies by engaging themselves in perpetual learning.

# PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

**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 modelling 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

**PSO1:** Apply the expertise in adaptive algorithms to develop quality software applications.

**PSO2:** Get employed or become an entrepreneur through their capabilities in basic and advanced technologies.

## INDUCTION PROGRAMME

| S.No. | Course Name | Category | L-T-P-C |
|---|---|---|---|
| 1 | Physical Activities -- Sports, Yoga and Meditation, Plantation | MC | 0-0-6-0 |
| 2 | Career Counseling | MC | 2-0-2-0 |
| 3 | Orientation to all branches -- career options, tools,etc. | MC | 3-0-0-0 |
| 4 | Orientation on admitted Branch -- corresponding labs, tools and platforms | EC | 2-0-3-0 |
| 5 | Proficiency Modules & Productivity Tools | ES | 2-1-2-0 |
| 6 | Assessment on basic aptitude and mathematicalskills | MC | 2-0-3-0 |
| 7 | Remedial Training in Foundation Courses | MC | 2-1-2-0 |
| 8 | Human Values & Professional Ethics | MC | 3-0-0-0 |
| 9 | Communication Skills -- focus on Listening, Speaking, Reading, Writing skills | BS | 2-1-2-0 |
| 10 | Concepts of Programming | ES | 2-0-2-0 |

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| I Year I Semester (Theory-5, Lab-4) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | BS | 23A0009T | Communicative English | 2 | 0 | 0 | 2 |
| 2 | BS | 23A0004T | Chemistry | 3 | 0 | 0 | 3 |
| 3 | BS | 23A0001T | Linear Algebra & Calculus | 3 | 0 | 0 | 3 |
| 4 | ES | 23A0101T | Basic Civil & Mechanical Engineering | 3 | 0 | 0 | 3 |
| 5 | ES | 23A0501T | Introduction to Programming | 3 | 0 | 0 | 3 |
| 6 | BS | 23A0010P | Communicative English Lab | 0 | 0 | 2 | 1 |
| 7 | BS | 23A0007P | Chemistry Lab | 0 | 0 | 2 | 1 |
| 8 | ES | 23A0302P | Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 9 | ES | 23A0502P | Computer Programming Lab | 0 | 0 | 3 | 1.5 |
| 10 | BS | 23AYG01P | Health and wellness, Yoga and Sports | - | - | 1 | 0.5 |
| **Total** | | | | **14** | **00** | **11** | **19.5** |

| **Category** | **Credits** |
|---|---|
| Basic Science Course(BS) | 10.5 |
| Engineering Science Courses(ES) | 9 |
| Total | 19.5 |

| I Year II Semester (Theory-5, Lab-4) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | BS | 23A0003T | Engineering Physics | 3 | 0 | 0 | 3 |
| 2 | BS | 23A0002T | Differential Equations & Vector Calculus | 3 | 0 | 0 | 3 |
| 3 | ES | 23A0201T | Basic Electrical and Electronics Engineering | 3 | 0 | 0 | 3 |
| 4 | ES | 23A0301T | Engineering Graphics | 1 | 0 | 4 | 3 |
| 5 | ES | 23A0503P | IT Workshop | 0 | 0 | 2 | 1 |
| 6 | ES | 23A0504T | Data Structures | 3 | 0 | 0 | 3 |
| 7 | BS | 23A0006P | Engineering Physics Lab | 0 | 0 | 2 | 1 |
| 8 | ES | 23A0202P | Electrical and Electronics Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 9 | ES | 23A0505P | Data Structures Lab | 0 | 0 | 3 | 1.5 |
| 10 | BS | 23ANS01P | NSS/NCC/Scouts & Guides/ Community Service | - | - | 1 | 0.5 |
| **Total** | | | | **13** | **00** | **15** | **20.5** |

| **Category** | **Credits** |
|---|---|
| Basic Science Course(BS) | 7.5 |
| Engineering Science Courses(ES) | 13 |
| Total | 20.5 |

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| II Year I Semester (Theory-5, Lab-2, SC-1, MC-1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | BS | 23A0015T | Discrete Mathematics & Graph Theory | 3 | 0 | 0 | 3 |
| 2 | HS | 23A0021T | Universal Human Values 2 Understanding Harmony and Ethical human conduct | 2 | 1 | 0 | 3 |
| 3 | ES | 23A0406T | Digital Logic and Computer Organization | 3 | 0 | 0 | 3 |
| 4 | PC | 23A0506T | Advanced Data Structures & Algorithm Analysis | 3 | 0 | 0 | 3 |
| 5 | PC | 23A0507T | Object-Oriented Programming Through JAVA | 3 | 0 | 0 | 3 |
| 6 | PC | 23A0508P | Advanced Data structures and Algorithms Analysis Lab | 0 | 0 | 3 | 1.5 |
| 7 | PC | 23A0509P | Object-Oriented Programming Through JAVA Lab | 0 | 0 | 3 | 1.5 |
| 8 | SE | 23A0510P | Python programming | 0 | 1 | 2 | 2 |
| 9 | MC | 23A0025T | Environmental Science | 2 | 0 | 0 | - |
| | | | Total | **15** | **2** | **10** | **20** |

| **Category** | **Credits** |
|---|---|
| Basic Science Course (BS) | 3 |
| Professional Core Courses (PC) | 9 |
| Engineering Science Courses (ES) | 3 |
| Humanities and Social Science Course (HS) | 3 |
| Skill Enhancement Course (SE) | 2 |
| Mandatory Course(MC) | - |
| Total | 20 |

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| II Year II Semester (Theory-6, Lab-3, SC-1, MC-1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | HS | 23A0022T<br>23A0023T<br>23A0024T | Managerial Economics and Financial Analysis<br>Organizational Behavior<br>Business Environment | 2 | 0 | 0 | 2 |
| 2 | BS | 23A0017T | Probability & Statistics | 3 | 0 | 0 | 3 |
| 3 | PC | 23A0511T | Operating Systems | 3 | 0 | 0 | 3 |
| 4 | PC | 23A0512T | Database Management Systems | 3 | 0 | 0 | 3 |
| 5 | PC | 23A0513T | Software Engineering | 3 | 0 | 0 | 3 |
| 6 | PC | 23A0514P | Operating Systems Lab | 0 | 0 | 3 | 1.5 |
| 7 | PC | 23A0515P | Database Management Systems Lab | 0 | 0 | 3 | 1.5 |
| 8 | SE | 23A0516P | Full Stack Development-1 | 0 | 1 | 2 | 2 |
| 9 | HS | 23A0413T | Design Thinking & Innovation | 0 | 1 | 2 | 2 |
| | | | Total credits | | | | **21** |
| Mandatory Community Service Project of 08 weeks duration during summer vacation | | | | | | | |

| **Category** | **Credits** |
|---|---|
| Basic Science Course (BS) | 3 |
| Professional Core Courses (PC) | 12 |
| Skill Enhancement Course (SE) | 2 |
| Humanities and Social Science Course (HS) | 4 |
| Total | 21 |

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**III Year I Semester (Theory-5, Lab-2, SE-1, MC-1, PR-1)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C |
| 1 | PC | 23A3301T | Artificial Intelligence | 3 | 0 | 0 | 3 |
| 2 | PC | 23A0520T | Computer Networks & Internet Protocols | 3 | 0 | 0 | 3 |
| 3 | PC | 23A0521T | Automata Theory and Compiler Design | 3 | 0 | 0 | 3 |
| 4 | PC | 23A0522T | Introduction to Quantum Technologies and Applications | 3 | 0 | 0 | 3 |
| 5 | PE | 23A0524Ta<br>23A0524Tb<br>23A0416T<br>23A0524Tc | **Professional Elective-I**<br>Object Oriented Analysis and Design<br>Soft Computing<br>Introduction to Microprocessors & Microcontrollers<br>Data Warehousing & Data Mining | 3 | 0 | 0 | 3 |
| 6 | OE | | Open Elective-I | 3 | 0 | 0 | 3 |
| 7 | PC | 23A0525P | Artificial Intelligence Lab | 0 | 0 | 3 | 1.5 |
| 8 | PC | 23A0526P | Computer Networks & Internet Protocols Lab | 0 | 0 | 3 | 1.5 |
| 9 | SE | 23A0527P | **Skill Enhancement Course**<br>Full Stack Development – II | 0 | 1 | 2 | 2 |
| 10 | MC | 23A0420P | Tinkering Lab | 0 | 0 | 2 | 1 |
| 11 | PR | 23A0528 | Evaluation of Community Service Project | - | - | - | 2 |
| **Total** | | | | **18** | **1** | **10** | **26** |

| Category | Credits |
|---|---|
| Professional Core Courses(PC) | 15 |
| Professional Elective Courses(PE) | 3 |
| Open Elective Courses(OE) | 3 |
| Skill Enhancement Course(SE) | 2 |
| Mandatory Course(MC) | 1 |
| Community Service Project (PR) | 2 |
| Total | 26 |

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## Open Elective – I

| Sl. No. | Course Code | Course Title | Offered by the Dept |
|---|---|---|---|
| 1 | 23A0148T | Green Buildings | CIVIL |
| 2 | 23A0149T | Construction Technology and Management | CIVIL |
| 3 | 23A0222T | Electrical Safety Practices and Standards | EEE |
| 4 | 23A0319T | Sustainable Energy Technologies | ME |
| 5 | 23A0442T | Electronic Circuits | ECE |
| 6 | 23A0547T | Quantum Technologies And Applications | CSE & Allied |
| 7 | 23A0027T | Mathematics for Machine Learning and AI | Mathematics |
| 8 | 23A0034T | Materials Characterization Techniques | Physics |
| 9 | 23A0040T | Chemistry of Energy Systems | Chemistry |
| 10 | 23A0044T | English for Competitive Examinations | Humanities |
| 11 | 23A0051T | Entrepreneurship and New Venture Creation | Humanities |

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**B.Tech III Year II Semester (Theory-6, Lab-2, SE-1, MC-1)**

| Sl. No. | Category | Course Code | Course Title | Hours per week L | T | P | Credits C |
|---|---|---|---|---|---|---|---|
| 1 | PC | 23A0529T | Machine Learning | 3 | 0 | 0 | 3 |
| 2 | PC | 23A0530T | Cloud Computing | 3 | 0 | 0 | 3 |
| 3 | PC | 23A0531T | Cryptography & Network Security | 3 | 0 | 0 | 3 |
| 4 | PE | 23A0532Ta<br>23A0532Tb<br>23A0532Tc<br>23A0449T | **Professional Elective-II**<br>Software Testing Methodologies<br>Cyber Security<br>DevOps<br>Embedded Systems Design | 3 | 0 | 0 | 3 |
| 5 | PE | 23A0533Ta<br>23A0533Tb<br>23A0533Tc<br>23A0533Td | **Professional Elective-III**<br>Software Project Management<br>Mobile Adhoc Networks<br>Natural Language Processing<br>Distributed Operating System | 3 | 0 | 0 | 3 |
| 6 | OE | | Open Elective – II | 3 | 0 | 0 | 3 |
| 7 | PC | 23A0534T | Machine Learning Lab | 0 | 0 | 3 | 1.5 |
| 8 | PC | 23A0535P | Cryptography & Network Security Lab | 0 | 0 | 3 | 1.5 |
| 9 | SE | 23A0026T | **Skill Enhancement Course**<br>Soft skills OR IELTS | 0 | 1 | 2 | 2 |
| 10 | MC | 23A0053T | **Audit Course**<br>Technical Paper Writing & IPR | 2 | 0 | 0 | - |
| 11 | PC | 23A0536 | Workshop | 0 | 0 | 0 | 0 |
| **Total** | | | | **20** | **1** | | **23** |
| Mandatory Industry Internship of 08 weeks duration during summer vacation | | | | | | | |

| Category | Credits |
|---|---|
| Professional Core Courses(PC) | 12 |
| Professional Elective Courses(PE) | 6 |
| Open Elective Courses(OE) | 3 |
| Skill Enhancement Course(SE) | 2 |
| Mandatory Course(MC) | - |
| Total | 23 |

## Open Elective – II

| Sl. No. | Course Code | Course Title | Offered by the Dept |
|---|---|---|---|
| 1 | 23A0150T | Disaster Management | CIVIL |
| 2 | 23A0151T | Sustainability in Engineering Practices | CIVIL |
| 3 | 23A0232T | Renewable Energy Sources | EEE |
| 4 | 23A0334Tb | Automation and Robotics | ME |
| 5 | 23A0443T | Digital Electronics | ECE |
| 6 | 23A0030T | Optimization Techniques for Engineers | Mathematics |
| 7 | 23A0029T | Mathematical Foundation Of Quantum Technologies | Mathematics |
| 8 | 23A0035T | Physics Of Electronic Materials And Devices | Physics |
| 9 | 23A0041T | Chemistry Of Polymers And Applications | Chemistry |
| 10 | 23A0045T | Academic Writing and Public Speaking | Humanities |

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**IV Year I Semester (Theory-6, SEC-1, MC-1, PR-1)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C |
| 1 | PC | 23A0537T | Deep Learning | 2 | 1 | 0 | 3 |
| 2 | HS | 23A0049T<br>23A0050T<br>23A0048T | **Management Course- II**<br>1. Business Ethics and Corporate Governance<br>2. E-Business<br>3. Management Science | 2 | 0 | 0 | 2 |
| 3 | PE | 23A0538Ta<br>23A0538Tb<br>23A0538Tc<br>23A0450T | **Professional Elective-IV**<br>1. Software Architecture & Design Patterns<br>2. Blockchain Technology<br>3. Augmented Reality & Virtual Reality<br>4. Internet of Things | 3 | 0 | 0 | 3 |
| 4 | PE | 23A0539Ta<br>23A0539Tb<br>23A0539Tc<br>23A0539Td | **Professional Elective-V**<br>1. Agile methodologies<br>2. Metaverse<br>3. Computer Vision<br>4. Cyber Physical Systems | 3 | 0 | 0 | 3 |
| 5 | OE | | **Open Elective-III** | 3 | 0 | 0 | 3 |
| 6 | OE | | **Open Elective-IV** | 3 | 0 | 0 | 3 |
| 7 | SE | 23A0540P | **Skill Enhancement Course**<br>Prompt Engineering | 0 | 1 | 2 | 2 |
| 8 | MC | 23A0054T | **Audit Course**<br>Gender Sensitization | 2 | 0 | 0 | - |
| 9 | PR | 23A0541 | Evaluation of Industry Internship | - | - | - | 2 |
| **Total** | | | | **18** | **2** | **02** | **21** |

| Category | Credits |
|---|---|
| Professional Core Courses(PC) | 3 |
| Professional Elective Courses(PE) | 6 |
| Humanities and Social Science Course(HS) | 2 |
| Open Elective Courses(OE) | 6 |
| Skill Enhancement Course(SE) | 2 |
| Mandatory Course(MC) | - |
| Industry Internship (PR) | 2 |
| Total | 21 |

## Open Elective – III

| Sl. No. | Course Code | Course Title | Offered by the Dept |
|---|---|---|---|
| 1 | 23A0152T | Building Materials and Services | CIVIL |
| 2 | 23A0153T | Environmental Impact Assessment | CIVIL |
| 3 | 23A0241T | Smart Grid Technologies | EEE |
| 4 | 23A0335T | 3D Printing Technologies | ME |
| 5 | 23A0416T | Microprocessors and Microcontrollers | ECE |
| 6 | 23A0031T | Wavelet transforms and its Applications | Mathematics |
| 7 | 23A0036T | Smart Materials And Devices | Physics |
| 8 | 23A0037T | Introduction to Quantum Mechanics | Physics |
| 9 | 23A0042T | Green Chemistry And Catalysis For Sustainable Environment | Chemistry |
| 10 | 23A0046T | Employability Skills | Humanities |

## Open Elective – IV

| Sl. No. | Course Code | Course Title | Offered by the Dept |
|---|---|---|---|
| 1 | 23A0154T | Geo-Spatial Technologies | CIVIL |
| 2 | 23A0155T | Solid Waste Management | CIVIL |
| 3 | 23A0242T | Electric Vehicles | EEE |
| 4 | 23A0334Td | Total Quality Management | ME |
| 5 | 23A0444T | Transducers and Sensors | ECE |
| 6 | 23A3315a | Introduction to Quantum Computing | CSE & Allied |
| 7 | 23A0032T | Financial Mathematics | Mathematics |
| 8 | 23A0038T | Sensors And Actuators For Engineering Applications | Physics |
| 9 | 23A0043T | Chemistry Of Nano materials and Applications | Chemistry |
| 10 | 23A0047T | Literary Vibes | Humanities |

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| IV Year II Semester (PR-1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | PR | 23A0542 | Internship | - | - | 24 | 4 |
| | | | Project | - | - | - | 8 |
| **Total** | | | | | | | **12** |

# RG 23

# CSE COURSE SYLLABUS

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## Vision

To evolve as a leading computer science and engineering centre producing competent technocrats to meet the demands of ever-changing industry and society.

## Mission

**DM1:** Imparting quality education through innovative teaching learning processes.

**DM2:** Motivating students to upgrade their technical expertise by promoting learner centric activities.

**DM3:** Inculcating ethical values and interpersonal skills in the learners.

**DM4:** upgrading knowledge in cutting edge technologies keeping pace with industrial standards.

## Program Educational Outcomes

**PEO1:** Outperform in professional career or higher learning by upgrading skills in Computer Science and Engineering stream

**PEO2:** Provide computing solutions for complex problems to meet industry demands and societal needs.

**PEO3:** Offer ethical, socially sensitive solutions as professionals and as entrepreneurs in Computer Science and other engineering disciplines.

**PEO4:** Leverage new computing technologies by engaging themselves in perpetual learning.

# PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

**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 modelling 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

**PSO1:** Apply the expertise in adaptive algorithms to develop quality software applications.

**PSO2:** Get employed or become an entrepreneur through their capabilities in basic and advanced technologies.

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E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

## INDUCTION PROGRAMME

| S.No. | Course Name | Category | L-T-P-C |
|---|---|---|---|
| 1 | Physical Activities -- Sports, Yoga and Meditation, Plantation | MC | 0-0-6-0 |
| 2 | Career Counseling | MC | 2-0-2-0 |
| 3 | Orientation to all branches -- career options, tools,etc. | MC | 3-0-0-0 |
| 4 | Orientation on admitted Branch -- corresponding labs, tools and platforms | EC | 2-0-3-0 |
| 5 | Proficiency Modules & Productivity Tools | ES | 2-1-2-0 |
| 6 | Assessment on basic aptitude and mathematicalskills | MC | 2-0-3-0 |
| 7 | Remedial Training in Foundation Courses | MC | 2-1-2-0 |
| 8 | Human Values & Professional Ethics | MC | 3-0-0-0 |
| 9 | Communication Skills -- focus on Listening, Speaking, Reading, Writing skills | BS | 2-1-2-0 |
| 10 | Concepts of Programming | ES | 2-0-2-0 |

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**I Year I Semester (Theory-5, Lab-4)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C |
| 1 | BS | 23A0009T | Communicative English | 2 | 0 | 0 | 2 |
| 2 | BS | 23A0004T | Chemistry | 3 | 0 | 0 | 3 |
| 3 | BS | 23A0001T | Linear Algebra & Calculus | 3 | 0 | 0 | 3 |
| 4 | ES | 23A0101T | Basic Civil & Mechanical Engineering | 3 | 0 | 0 | 3 |
| 5 | ES | 23A0501T | Introduction to Programming | 3 | 0 | 0 | 3 |
| 6 | BS | 23A0010P | Communicative English Lab | 0 | 0 | 2 | 1 |
| 7 | BS | 23A0007P | Chemistry Lab | 0 | 0 | 2 | 1 |
| 8 | ES | 23A0302P | Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 9 | ES | 23A0502P | Computer Programming Lab | 0 | 0 | 3 | 1.5 |
| 10 | BS | 23AYG01P | Health and wellness, Yoga and Sports | - | - | 1 | 0.5 |
| **Total** | | | | **14** | **00** | **11** | **19.5** |

| Category | Credits |
|---|---|
| Basic Science Course(BS) | 10.5 |
| Engineering Science Courses(ES) | 9 |
| Total | 19.5 |

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**B.Tech I Year I Semester**

**COMMUNICATIVE ENGLISH**
(Common to CSE, AI&ML, DS, CS, CE)

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0009T | 2:0:0 | 2 | CIE: 30 SEE:70 | 3 Hours | BS |

**Course Objectives:**

- Facilitate effective **listening skills** for better comprehension of academic lectures and English spoken by native speakers
- Help improve **speaking skills** motivating the learners to participate in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate **reading skills** for comprehension of various academic texts and authentic materials
- Impart effective strategies for good **writing skills** in summarizing, writing well organized essays, drafting formal letters and designing well structured reports
- Broaden the knowledge base of **grammatical structures** and **vocabulary** and encourage their
- appropriate use in speech and writing

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO1:** The learner will be able to speak and write grammatically accurate sentences through applications of principles of English grammar

**CO2:** The learner will enhance vocabulary skills to build strong language skills.

**CO3:** The learner acquires the ability to understand the academic text from multiple dimensions employing ethical and logical reasoning based on accurate comprehension

**CO4:** The learner gains evaluation potential by employing standard reading & listening strategies to grasp the core essence and spirit of the text

**CO5:** The learner will gain mastery on speaking & writing skills through the application of relevant guidelines, through consistent practice of functional English expression

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit- I** | **HUMAN VALUES: Gift of Magi (Short Story)** | **8** |

**Listening:** Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

**Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

**Reading**: Skimming to get the main idea of a text Scanning to look for specific pieces of information.

**Writing:** Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

**Grammar:** Parts of Speech, Basic Sentence Structures-forming questions

**Vocabulary:** Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

| | | |
|---|---|---|
| **Unit- II** | **The Brook by Alfred Tennyson (Poem)** | **7** |

**Listening:** Answering a series of questions about main idea and supporting ideas after listening to audio texts.

**Speaking:** Discussion in pairs/small groups on specific topics followed by short structured talks.

**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

**Writing:** Structure of a paragraph - Paragraph writing (specific topics)

**Grammar:** Cohesive devices - linkers, use of articles and zero article; prepositions.

**Vocabulary:** Homonyms, Homophones, Homographs.

| Unit- III | BIOGRAPHY: Elon Musk | 6 |
|---|---|---|

**Listening:** Listening for global comprehension and summarizing what is listened to.
**Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed
**Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
**Writing:** Summarizing, Note-making, paraphrasing
**Grammar:** Verbs - tenses; subject-verb agreement; Compound words**,**
**Vocabulary:** Compound words, Collocations

| Unit- IV | INSPIRATION: The Toys of Peace -Saki | 6 |
|---|---|---|

**Listening:** Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
**Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
**Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data
**Writing**: Letter Writing: Official Letters, Resumes
**Grammar :** Reporting verbs, Direct & Indirect speech, Active & Passive Voice
**Vocabulary:** Words often confused, Jargons

| Unit- V | MOTIVATION: The Power of Intrapersonal Communication(An Essay) | 5 |
|---|---|---|

**Listening:** Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
**Speaking:** Formal oral presentations on topics from academic contexts
**Reading:** Reading for Comprehension
**Writing:** Writing structured essays on specific topics**.**
**Grammar:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
**Vocabulary:** Technical Jargons

**Textbooks:**

1. " Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

**Reference Books:**

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

**Web Resources**:
**Grammar**:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

**Vocabulary**

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

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**B.Tech I Year I Semester**

**CHEMISTRY**
**(Common to CSE, AI&ML, CS, ECE, EEE, DS)**

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0004T | 3:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | BS |

**Course Objectives:**

- To familiarize chemistry and its applications.
- To train the students on the principles and applications of electrochemistry and polymers.
- To introduce instrumental methods.

**Course Outcomes (CO):**

**CO1:** Describe Planck's quantum theory, dual nature of matter, Schrodinger equation, molecular orbital Theory and molecular orbital energy level diagram of different molecules
**CO2:** Explain Crystal field theory, splitting in octahedral and tetrahedral geometry and the magnetic behavior, Oxidation state, coordination and color of complexes.
**CO3:** Explain the principle of Band diagrams of conductors, superconductor, semiconductors and insulator and nonmaterial
**CO4:** Discuss the principles of electrochemistry in potentiometry, conductometry, battery and electrochemical sensors
**CO5:** Explain polymerization and the preparation, properties, and applications of thermoplastics &thermosetting, elastomers, & conducting polymers
**CO6:** Discuss the different applications of analytical instruments

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit- I** | **Structure and Bonding Models** | **9** |

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ2, particle in one dimensional box, molecular orbital theory – bonding in homo- and hetero-nuclear diatomic molecules – energy level diagrams of O2, CO, and NO. π- molecular orbitals of butadiene and benzene, calculation of bond order.

| **Unit- II** | **Modern Engineering materials** | **10** |
|---|---|---|

Semiconductors – Introduction, basic concept, application
Superconductors: Introduction, Basic concept and Applications.
Super capacitors: Introduction, Basic concept, Classification and Applications.
Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphine nano particles

| **Unit- III** | **Electrochemistry and Applications** | **10** |
|---|---|---|

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).
Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

| **Unit- IV** | **Polymer Chemistry** | **10** |
|---|---|---|

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.
Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications.

Biodegradable polymers - **poly dioxanone,** Polyglycolic Acid (PGA), Polylactic Acid (PLA).

| **Unit- V** | **Instrumental Methods and applications** | **9** |
|---|---|---|

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification, **Gas chromatography,** HPLC: Principle,
Instrumentation and applications

**Textbooks:**

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010.

**Reference Books:**

1. G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. J.M.Lehn, Supra Molecular Chemistry, VCH Publications

**Textbooks:**

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010.

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**B.Tech I Year I Semester**

| **LINEAR ALGEBRA &CALCULUS (Common to all branches)** | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0001T** | **3:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **BS** |

**Course Objectives:**

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO1:** Solving systems of linear equations that is needed by engineers for practical applications.
**CO2:** Find the eigen values and eigen vectors to facilitate the calculation of matrix characteristics.
**CO3:** Utilize mean value theorems to real life problems.
**CO4:** Apply the technique of partial differentiation to find the Jacobian and the extreme values of functions of several variables.
**CO5:** Apply the techniques of multiple integrals to find the areas and volumes.

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit- I** | **Matrices** | **10** |
| Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations - Gauss elimination method, Iteration Methods: Gauss- Jacobi and Gauss Seidel Iteration Methods. Applications: Finding the current in electrical circuits. | | |
| **Unit- II** | **Eigen values, Eigenvectors and Orthogonal Transformation** | **8** |
| Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation | | |
| **Unit- III** | **Calculus** | **10** |
| Mean Value Theorems: Rolle's Theorem (Without Proof), Lagrange's mean value theorem (Without Proof) with their geometrical interpretation, Cauchy's mean value theorem (Without Proof), Taylor's and Maclaurin theorems with remainders (Without Proof), Problems and applications on the above theorems. | | |
| **Unit- IV** | **Partial differentiation and Applications (Multi variable calculus)** | **10** |
| Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers. | | |
| **Unit- V** | **Multiple Integrals (Multi variable Calculus)** | **10** |
| Double integrals, triple integrals, change of order of integration (Cartesian Coordinate only), change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals) | | |

**Textbooks:**

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

**Reference Books:**

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, G$_{3}$lyn James, Pearson publishers, 2018, 5th Edition.

**B.Tech I Year I Semester**

<table>
<tr><td colspan="6">BASIC CIVIL & MECHANICAL ENGINEERING<br>(Common to all branches)</td></tr>
<tr><td>Course Code</td><td>L:T:P</td><td>Credits</td><td>Exam Marks</td><td>Exam Duration</td><td>Course Type</td></tr>
<tr><td>23A0101T</td><td>3:0:0</td><td>3</td><td>CIE: 30 SEE:70</td><td>3 Hours</td><td>ES</td></tr>
<tr><td colspan="6">Course Objectives:</td></tr>
<tr><td colspan="6">• Get familiarized with the scope and importance of Civil Engineering sub-divisions<br>• Introduce the preliminary concepts of surveying.<br>• Acquire preliminary knowledge on Transportation and its importance in nation’s economy.<br>• Get familiarized with the importance of quality, conveyance and storage of water<br>• Introduction to basic civil engineering materials and construction techniques</td></tr>
<tr><td colspan="6">Course Outcomes (CO):</td></tr>
<tr><td colspan="6">On completion of this course, the students are able to:<br>CO1: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying<br>CO2: Realize the importance of Transportation in nation's economy and the engineering measures related to highways in terms of geometrics<br>CO3: Understand the importance of water resources and storage structures so that the social responsibilities of water conservation will be appreciated.<br>CO4: Understand the different manufacturing processes<br>CO5: The basics of thermal engineering and its applications.<br>CO6: Describe the working of different mechanical power transmission systems and power Plants; learn basics of robotics.</td></tr>
<tr><td colspan="5">Syllabus</td><td>Total Hours:48</td></tr>
<tr><td>Unit- I</td><td colspan="4"></td><td>9</td></tr>
<tr><td colspan="6">Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of CivilEngineering-StructuralEngineering-Geo-technicalEngineering-TransportationEngineering Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline- BuildingConstructionandPlanning-ConstructionMaterials-Cement-Aggregate-Bricks-Cementconcrete-Steel. Introduction to Prefabricated construction Techniques</td></tr>
<tr><td>Unit- II</td><td colspan="4"></td><td>10</td></tr>
<tr><td colspan="6">Fluid Mechanics: Properties of fluids and types of fluids.<br>Surveying: Objectives of Surveying- Horizontal Measurements-Angular Measurements-Introduction to Bearings Leveling instruments used for leveling – Simple problems on leveling and bearings-Contour mapping</td></tr>
<tr><td>Unit- III</td><td colspan="4"></td><td>9</td></tr>
<tr><td colspan="6">Transportation Engineering Importance of Transportation in Nation's economic development-Types of Highway Pavements- Flexible Pavements and Rigid Pavements-Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.<br><br>Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs)</td></tr>
</table>

**Textbooks:**
1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd.
2. Fourth Edition.
3. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
4. BasicCivilEngineering,SatheeshGopi,PearsonPublications,2009,FirstEdition

**Reference Books:**
1. Surveying, Vol -I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers,Delhi.2016
3. Irrigation Engineering and Hydraulic Structures – Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K. Khanna, C.E.G. Justoand Veeraraghavan, Nemchandand Brothers Publications 2019. 10th Edition.

E- Resources :

1. https://archive.nptel.ac.in/courses/105/106/105106201/

| PART B | | |
|---|---|---|
| Syllabus | | |
| **Unit- I** | | **9** |
| **Introduction to Mechanical Engineering:** Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials | | |
| **Unit- II** | | **9** |
| **Manufacturing Processes:** Principles of Casting, Forming, and joining processes, Machining, Introduction CNC machines, 3D printing, and Smart manufacturing. **Thermal Engineering** – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles | | |
| **Unit- III** | | **9** |
| **Power plants** – working principle of Steam, Diesel, Hydro, Nuclear power plants. Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications. Introduction to **Robotics** - Joints & links, configurations, and applications of robotics. (Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject) | | |

**Textbooks:**
1. Internal Combustion Engines by V. Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, cengage learning India pvt. Ltd

**Reference Books:**
1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata Mcgraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata Mcgraw Hill publications (India) Pvt. Ltd.

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**B.Tech I Year I Semester**

**INTRODUCTION TO PROGRAMMING**
**(Common to all branches)**

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0501T | 3:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions and arrays.
- To encourage collaborative learning and team work in coding projects.

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO1:** Understand basics of computers, the concept of algorithm and algorithmic thinking.

**CO2:** Analyse a problem and develop an algorithm to solve it.

**CO3:** Implement various algorithms using the C programming language.

**CO4:** Understand more advanced features of C language.

**CO5:** Develop problem-solving skills and the ability to debug and optimize the code.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit- I** | **Introduction to Programming and Problem Solving** | **10** |

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool),pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting. Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms

| | | |
|---|---|---|
| **Unit- II** | **Control Structures** | **8** |

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue..

| | | |
|---|---|---|
| **Unit- III** | **Arrays and Strings** | **10** |

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings

| | | |
|---|---|---|
| **Unit- IV** | **Pointers & User Defined Data types** | **10** |

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types - Structures and Unions.

| | | |
|---|---|---|
| **Unit- V** | **Functions & File Handling** | **10** |

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, command line arguments, Preprocessor directives, Basics of File Handling

**Textbooks:**

1. "The C Programming Language", Brian W.Kernighan and Dennis M.Ritchie,Prentice-Hall,1988
2. Schaum's Outline of Programming with C,Byron SGottfried, McGraw-HillEducation,1996

**Reference Books:**

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-HillEducation, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

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## B.Tech I Year I Semester

| COMMUNICATIVE ENGLISH LAB (Common to all branches) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0010P** | **0:0:2** | **1** | **CIE: 30 SEE:70** | **3 Hours** | **BS** |

**Course Objectives:**

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning students will get trained in the basic communication skills and also make them ready to face job interviews

**Course Outcomes (CO):**

**CO1:** Analyze the English speech sounds, stress, intonation for better Listening practice
**CO2:** Apply communication skills through various language learning activities
**CO3:** Application of writing skills through design and preparation of professional Resume & email writing
**CO4:** Create effective resonate and prepare themselves to face interviews in future

| **Syllabus** | **Total Hours:48** |
|---|---|

**List of Experiments**

1. VOWELS & CONSONANTS
2. NEUTRILIZATION/ ACCENT RULES
3. COMMUNICATION SKILLS & JAM
4. ROLE PLAY OR CONVERSATIONAL PRACTICE
5. EMAIL WRIRING
6. RESUME WRITING, COVER LETTER, SOP
7. GRPOUP DISCUSSION-METHODS & PRACTICE
8. DEBATE - METHOD & PRACTICE
9. PPT PRESENTATION / PSTER PRESENTATION
10. INTERVIEW SKILLS

**Suggested Software:** Walden InfoTech / Young India Films

**Reference Books:**

1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
2. Grant Taylor: English Conversation Practice, Tata McGraw-Hill Education India, 2016
3. Hewing’s, Martin. Cambridge Academic English (B2). CUP, 2012.
4. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students,(3rd Ed) Trinity Press.

**Online Learning Resources/Virtual Labs:**

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc

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**B.Tech I Year I Semester**

**CHEMISTRY LAB**
**(Common to CSE, AI&ML, CS, ECE, EEE, DS)**

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0007P | 0:0:2 | 1 | CIE: 30 SEE:70 | 3 Hours | BS |

**Course Objectives:**

- Verify the fundamental concepts with experiments

**Course Outcomes (CO):**

**CO1:** Determine the cell constant and conductance of solutions and the strength of an acid by conductometry
**CO2:** Synthesize of advanced polymer materials
**CO3:** Measure the strength of an acid present in secondary battery and Ferrous ion using volumetric analysis
**CO4:** Determine the potentials and EMFs of solutions by Potentiometry
**CO5:** Identify some organic and inorganic compounds by instrumental methods
**CO6:** Synthesize of nano materials by simple methods

**Syllabus** **Total Hours:48**

**List of Experiments**

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Simultaneous estimation of Mn and Cr ions by spectrophotometry in water samples.
10. Wavelength measurement of sample through UV-Visible Spectroscopy
11. Identification of functional groups in organic compounds by IR Spectroscopy.
12. Preparation of nano materials by precipitation method
13. Estimation of Ferrous Iron by Dichrometry
14. Determination of Hardness of a groundwater sample
15. pH metric titration of strong acid vs strong base

(**Any 10 experiments from the above**

**Textbooks:**

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Jain & Jain. Engineering Chemistry: Dhanapath rai Publications., 2015.
3. S.S.Dara, Experiments and Calculations in Engineering Chemistry: S-Chand Publications, Revised edition, 2008.

**Reference Books:**

1. "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

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## ENGINEERING WORKSHOP
### (Common to all branches)

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0302P | 0:0:3 | 1.5 | CIE: 30 SEE:70 | 3 Hours | ES |

**Course Objectives:**

- To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

**Course Outcomes (CO):**

CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, and foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice

| Syllabus | Total Hours:48 |
|---|---|

**List of Experiments**

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a. Half –Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray b)Conical funnel c)Elbow pipe d)Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V-fit b) Dovetail fit c)Semi-circular fit
   d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series b)Two-way switch c) Go down lighting
   d)Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters

**Textbooks:**

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn.2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 &2017.

**Reference Books:**


1. Elements of Workshop Technology, Vol. I by S.K. Hajra Choudhury &Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

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**B.Tech I Year I Semester**

| COMPUTER PROGRAMMING LAB (Common to CSE, AI&ML, DS, CS, CE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0502P** | **0:0:3** | **1.5** | **CIE: 30 SEE:70** | **3 Hours** | **ES** |

**Course Objectives:**

The course aims to give students hands – on experience and train them on the concepts of the C-programming language.

**Course Outcomes (CO):**

**CO1:** Read, understand, and trace the execution of programs written in C language.
**CO2:** Select the right control structure for solving the problem.
**CO3:** Develop C programs which utilize memory efficiently using programming constructs like pointers.
**CO4:** Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

**Syllabus**

**WEEK 1**

**Objective:** Getting familiar with the programming environment on the computer and writing the first program.

**Suggested Experiments/Activities:**

**Tutorial 1:** Problem-solving using Computers.

**Lab1:** Familiarization with programming environment

i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

**WEEK 2**

**Objective:** Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

**Suggested Experiments /Activities:**

**Tutorial 2:** Problem-solving using Algorithms and Flow charts.

**Lab 1:** Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

**WEEK 3**

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

**Suggested Experiments/Activities:**

**Tutorial 3:** Variable types and type conversions:

**Lab 3:** Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

**WEEK 4**

**Objective:** Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

**Suggested Experiments/Activities:**

**Tutorial4:** Operators and the precedence nd as associativity:

**Lab4:** Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.
   - A+B*C+(D*E) + F*G
   - A/B*C-B+A*D/3
   - A+++B---A
   - J= (i++) + (++i)

ii) Find the maximum of three numbers using conditional operator

iii) Take marks of 5 subjects in integers, and find the total, average in float

**WEEK 5**

**Objective:** Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

**Suggested Experiments/Activities:**

**Tutorial 5:** Branching and logical expressions:

**Lab 5**: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.

ii) Write a C program to generate electricity bill.

iii) Find the roots of the quadratic equation.

iv) Write a C program to simulate a calculator using switch case.

v) Write a C program to find the given year is a leap year or not.

**WEEK 6**

**Objective:** Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

**Suggested Experiments/Activities:**

**Tutorial 6:** Loops, while and for loops

**Lab 6:** Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.

ii) Find the given number is a prime or not.

iii) Compute sine and cos series

iv) Checking a number palindrome

v) Construct a pyramid of numbers.

**WEEK 7**

**Objective:** Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

**Suggested Experiments/Activities:**

**Tutorial 7:** 1 D Arrays: searching.

**Lab 7:**1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.

ii) Perform linear search on1D array.

iii) The reverse of a 1D integer array

iv) Find 2's complement of the given binary number.

v) Eliminate duplicate elements in an array.

**WEEK 8:**

**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

**Suggested Experiments/Activities:**

**Tutorial 8:** 2 D arrays, sorting and Strings.

**Lab 8:** Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

**WEEK 9**

**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

**Suggested Experiments/Activities:**

**Tutorial 9:** Pointers, structures and dynamic memory allocation

**Lab 9:** Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

**WEEK 10:**

**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

**Suggested Experiments/Activities:**

**Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists

**Lab10 :** Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type. and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

**Suggested Experiments/Activities:**

**Tutorial 9:** Pointers, structures and dynamic memory allocation

**Lab 9:** Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

**WEEK 10:**

**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

**Suggested Experiments/Activities:**

**Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists

**Lab10 :** Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type.

**WEEK 11:**

**Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

**Suggested Experiments/Activities:**

**Tutorial 11:** Functions, call by value, scope and extent,

**Lab 11:** Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

**WEEK 12:**

**Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

**Suggested Experiments/Activities:**

**Tutorial 12:** Recursion, the structure of recursive calls

**Lab 12:** Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

**WEEK 13:**

**Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

**Suggested Experiments/Activities:**

**Tutorial 13:** Call by reference, dangling pointers

**Lab 13:** Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
iv) Write a C program to find no of lowercase, uppercase, digits and othercharacters using pointers.

**WEEK14:**

**Objective:** To understand data files and file handling with various file I/O functions. Explore thedifferences between text and binary files.

**Suggested Experiments/Activities:**

**Tutorial 14:** File handling

**Lab 14:** File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

**Textbooks:**

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

**Reference Books:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

**Web Resources**:

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## B.Tech I Year I Semester

| HEALTH AND WELLNESS, YOGA AND SPORTS (Common to all branches) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23AYG01P** | **0:0:1** | **0.5** | **-** | **-** | **MC** |

**Course Objectives:**

- The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO-1:** Understand the importance of yoga and sports for Physical fitness and sound health.

**CO-2:** Demonstrate an understanding of health-related fitness components.

**CO-3:** Compare and contrast various activities that help enhance their health.

**CO-4:** Compare and contrast various activities that help enhance their health.

**CO-5:** Develop Positive Personality

### Syllabus

### Unit- I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

**Activities**:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

### Unit- II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

**Activities:**

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

### Unit- III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

**Activities:**

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics.
ii) Practicing cardio respiratory fitness, treadmill, run test, 9 min walk, skipping and running

**Reference Books:**


1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice.
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993.
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014.
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014


**General Guidelines:**

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

**Evaluation Guidelines:**

1. Evaluated for a total of 100 marks.
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

| I Year II Semester (Theory-5, Lab-4) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | BS | 23A0003T | Engineering Physics | 3 | 0 | 0 | 3 |
| 2 | BS | 23A0002T | Differential Equations & Vector Calculus | 3 | 0 | 0 | 3 |
| 3 | ES | 23A0201T | Basic Electrical and Electronics Engineering | 3 | 0 | 0 | 3 |
| 4 | ES | 23A0301T | Engineering Graphics | 1 | 0 | 4 | 3 |
| 5 | ES | 23A0503P | IT Workshop | 0 | 0 | 2 | 1 |
| 6 | ES | 23A0504T | Data Structures | 3 | 0 | 0 | 3 |
| 7 | BS | 23A0006P | Engineering Physics Lab | 0 | 0 | 2 | 1 |
| 8 | ES | 23A0202P | Electrical and Electronics Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 9 | ES | 23A0505P | Data Structures Lab | 0 | 0 | 3 | 1.5 |
| 10 | BS | 23ANS01P | NSS/NCC/Scouts & Guides/ Community Service | - | - | 1 | 0.5 |
| **Total** | | | | **13** | **00** | **15** | **20.5** |

| **Category** | **Credits** |
|---|---|
| Basic Science Course(BS) | 7.5 |
| Engineering Science Courses(ES) | 13 |
| Total | 20.5 |

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**B.Tech I Year II Semester**

| ENGINEERING PHYSICS (Common to all branches) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0003T** | **3:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **BS** |

**Course Objectives:**

- To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO-1:** Analyze the intensity variation of light due to polarization, interference and diffraction.

**CO-2:** Familiarize with the basics of crystals and their structures.

**CO-3:** Summarize various types of polarization of dielectrics and classify the magnetic materials.

**CO-4:** Apply fundamentals of quantum mechanics to band theory of solids.

**CO-5:** Identify the type of semiconductor using Hall Effect.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit- I** | **WAVE OPTICS** | **10** |

**Interference:** Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton’s Rings- Determination of wavelength and refractive index.

**Diffraction:** Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

**Polarization:** Introduction -Types of polarization - Polarization by reflection, refraction andDouble refraction - Nicol’s Prism -Half wave and Quarter wave plates

| **Unit- II** | **CRYSTALLOGRAPHY AND X-RAY DIFFRACTION** | **8** |
|---|---|---|

**Crystallography**: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

**X-ray diffraction:** Bragg’s law - X-ray Diffractometer – crystal structure determination by Laue’s and powder methods.

| **Unit- III** | **DIELECTRIC AND MAGNETIC MATERIALS** | **10** |
|---|---|---|

**Dielectric Materials:** Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dilectric constant – Frequency dependence of polarization – dielectric loss

**Magnetic Materials:** Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials

| **Unit- IV** | **QUANTUM MECHANICS AND FREE ELECTRON THEORY** | **10** |
|---|---|---|

**Quantum Mechanics:** Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

**Free Electron Theory:** Classical free electron theory1 (Qualitative with discussion of merits and demerits – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

| **Unit- V** | **SEMICONDUCTORS** | **10** |
|---|---|---|

**Semiconductors:** Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation - Hall effectand its applications.

**Superconductors-** Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – High $T_C$ superconductors– Applications of superconductors

**Textbooks:**

1. A Text book of Engineering Physics - M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers

**Reference Books:**

5. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning
6. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
7. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
8. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

**E-resources:**

3. https://www.textbooks.com/Catalog/MG5/Applied-Physics.php
4. https://edurev.in/courses/9596_Electromagnetic-Theory-Notes--Videos--MCQs--PPTs
5. https://libguides.ntu.edu.sg/c.php?g=867756&p=6226561
6. https://bookauthority.org/books/best-applied-physics-books
7. https://www.electronicsforu.com/resources/16-free-ebooks-on-material-science/2

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**B.Tech I Year II Semester**

**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**
**(Common to all branches)**

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0002T | 3:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | BS |

**Course Objectives:**

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

**Course Outcomes (CO):**

**CO1:** Solve the first order differential equations related to various engineering fields.
**CO2:** Solve the linear differential equations of higher order with constant coefficients
**CO3:** Identifysolutionmethodsforpartialdifferentialequationsthatmodelphysical processes.
**CO4:** Interpret the physical meaning of different operators such as gradient, curl and divergence.
**CO5:** Apply Green's, Stokes and Divergence theorem in work done, circulation, flux and triple integrals.

| Syllabus | | Total Hours:45 |
|---|---|---|
| **Unit- I** | **Differential equations of first order and first degree** | **9** |

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay Electrical circuits.

| | | |
|---|---|---|
| **Unit- II** | **Linear differential equations of higher order (Constant Coefficients)** | **9** |

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L- C-R Circuit problems and Simple Harmonic motion.

| | | |
|---|---|---|
| **Unit- III** | **Partial Differential Equations** | **9** |

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

| | | |
|---|---|---|
| **Unit- IV** | **Vector differentiation** | **9** |

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

| | | |
|---|---|---|
| **Unit- V** | **Vector integration** | **9** |

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related
Problems

**Textbooks:**

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

**Reference Books:**

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017
6. Engineering Mathematics I by T.K.V. Iyengar, B.Krishna Gandhi,, S. Chand Publications, 2015 Edition.

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**B.Tech I Year II Semester**

| BASIC ELECTRICAL & ELECTRONICS ENGINEERING (Common to all branches) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0201T** | **3:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **ES** |

**Course Objectives:**

- To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

**Course Outcomes (CO):**

On completion of this course, the students are able to:
**CO1:** Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
**CO2:** Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.
**CO3:** Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout CO5: Develop problem-solving skills and the ability to debug and optimize the code.
**CO4:** Analyze different electrical circuits, performance of machines and measuring instruments.
**CO5:** Evaluate different circuit configurations, Machine performance and Power systems operation.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit- I** | **DC & AC Circuits** | **10** |

**DC Circuits:** Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

**AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power,
reactive power and apparent power, Concept of power factor (Simple Numerical problems).

| | | |
|---|---|---|
| **Unit- II** | **Machines and Measuring Instruments** | **8** |

**Machines:** Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

**Measuring Instruments:** Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

| | | |
|---|---|---|
| **Unit- III** | **Energy Resources, Electricity Bill & Safety Measures** | **10** |

**Energy Resources:** Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

**Electricity bill:** Power rating of household appliances including air conditioners, PCs, Laptops,Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

**Equipment Safety Measures:** Working principle of Fuse and Miniature circuit breaker(MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

**Textbooks:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti,Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications,2018, Second Edition.

**Web Resources:**

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

**Reference Books:**

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019,Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford UniversityPress, 2017

**PART B: BASIC ELECTRONICS ENGINEERING**

**Course Objectives:**

- This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO1:** Apply the concept of science and mathematics to understand the working of diodes, transistors, and their applications.

**CO2:** Explain the characteristics of diodes and transistors.

**CO3:** Familiarize with the number systems, codes, Boolean algebra and logic gates.

**CO4:** Understand the working mechanism of different combinational, sequential circuits andtheir role in the digital systems.

| Syllabus | | |
|---|---|---|
| **Unit- I** | **Semiconductor Devices** | **10** |
| Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier | | |
| **Unit- II** | **Basic Electronic Circuits and Instrumentation** | **8** |
| Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system. | | |
| **Unit- III** | **DIGITAL ELECTRONICS** | **10** |
| Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, | | |

Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters(Elementary Treatment only)

**Textbooks:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

**Reference Books:**

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

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**B.Tech I Year II Semester**

| ENGINEERING GRAPHICS (Common to all branches) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0101T** | **1:0:4** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **ES** |

**Course Objectives:**

The students completing the course are expected to:

- Understand the basic principles and conventions of engineering drawing use engineering instruments and draw engineering curves.
- Use orthographic projections and make the students draw the projections of lines and planes inclined to both the planes.
- Draw the projections of the solids in different positions with respect to the reference planes.
- Understand the importance of sectioning and concept of development of surfaces.
- Represent and convert isometric views to orthographic views and vice versa

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO1:** Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.

**CO2:** Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.

**CO3:** Understandandapplyconceptsofsectionalviewstorepresentdetailsofsolidsinsimple positions.

**CO4:** Gain a clear understanding of the principles behind development of surfaces and to understand how to unfold basic geometric shapes into flat patterns.

**CO5:** Developtheabilitytodrawisometricviewsandorthographicviewsandshouldbeable to convert isometric views to orthographic views and vice versa.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit- I** | | **10** |

**Introduction:** Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

**Curves:** construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

**Scales:** Plain scales, diagonal scales and vernier scales.

| **Unit- II** | | **8** |
|---|---|---|

**Orthographic Projections**: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

**Projections of Straight Lines:** Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

**Projections of Planes:** regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

| **Unit- III** | | **10** |
|---|---|---|
| **Projections of Solids:** Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes. | | |
| **Unit- IV** | | **10** |
| **Sections of Solids:** Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.<br>**Development of Surfaces:** Methods of Development Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone. | | |
| **Unit- V** | | **10** |
| **Conversion of Views**: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.<br>**Computer graphics**: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*). | | |
| **Textbooks:**<br>1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016. | | |
| **Reference Books:**<br>1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.<br>2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson EducationInc, 2009.<br>3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017. | | |

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**B.Tech I Year II Semester**

**IT WORKSHOP**
**(Common to all branches)**

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0503P | 0:0:2 | 1 | CIE: 30 SEE:70 | 3 Hours | ES |

**Course Objectives:**

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spreadsheets and Presentation tools.

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO1:** Perform Hardware trouble shooting.
**CO2:** Understand Hardware components and interdependencies.
**CO3**: Safeguard computer systems from viruses/worms.
**CO4:** Document/ Presentation preparation.
**CO5:** Perform calculations using spreadsheets.

**Syllabus**

**PC Hardware & Software Installation**

**Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Task2:**Every student should is assemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Task 3**: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot(VMWare) with both Windows and Linux. Lab instructors should verify the install ation and follow it up with a Viva

**Task5:**Every student should install BOSS on the computer. The system should be configured as dual boot (VM Ware) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

**Internet & World Wide Web**

**Task1:** Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is No internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Task2:** Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Task3**: Search Engines &Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Task 4:** Cyber Hygiene: Students would be expose[1]d[4]to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active downloads to avoid viruses and/or worms.

**Task 5:**
Install any anti-virus software on your computer

**LaTeX and WORD**
**Task 1:** Word Orientation: The mentor needs to give an overview of Latex and Microsoft(MS)office or equivalent(FOSS) tool word: Importance of Latex and MS office or equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using Latex and word– Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
/
**Task 2:** Using Latex and Word to create a project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

**Task3:** Creating project abstract Features to be covered:-Formatting Styles, Inserting table,BulletsandNumbering,ChangingTextDirection,Cellalignment,Footnote,Hyperlink,Symbols,Spell Check, Track Changes.

**Task4:** Creating a News letter: Features to be covered:-Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

**EXCEL**
Excel Orientation: The mentor needs to tell the importance of MS office or equivalent(FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would becoveredineach.UsingExcel–Accessing,overviewoftoolbars,savingexcelfiles,Using help and resources.
**Task 1:** Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Task 2:** Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel –average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking,
Count function,

**LOOKUP/VLOOKUP**

**Task 3:** Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

**POWERPOINT**
**Task 1:** Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, WordArt, Formatting Text, Bullets and Numbering, AutoShapes, Lines and Arrows in PowerPoint.

**Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

**Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slides lotter, notes etc), and Inserting–Background, textures, Design Templates, Hidden slides.

**AITOOLS– Chat GPT**

**Task1:** Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing in complete sentences to see how the model completes them.

Ex: Prompt:"You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

**Task2:** Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

**Task 3:** Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

**Reference Books:**

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dreamtech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware- A Handbook, Kate J. Chase, PHI(Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfinson and Ken Quamme.– CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan–CISCO Press, Pearson Education, 3rd edition

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**B.Tech I Year II Semester**

## DATA STRUCTURES
**(Common to all branches)**

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0504T | 3:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

The students completing the course are expected to:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO1:** Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.

**CO2:** Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.

**CO3:** Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

**CO4:** Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.

**CO5:** Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.

**CO6:** Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit- I** | **Introduction to Linear Data Structures** | **10** |

**Introduction to Linear Data Structures:** Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort

| | | |
|---|---|---|
| **Unit- II** | **Linked Lists** | **8** |

**Linked Lists:** Singly linked lists: representation and operations, doubly linked lists and circularlinked lists, Comparing arrays and linked lists, Applications of linked lists.

| | | |
|---|---|---|
| **Unit- III** | **Stacks** | **10** |

**Stacks:** Introduction to stacks: properties and operations, implementing stacks using arrays andlinked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

| | | |
|---|---|---|
| **Unit- IV** | **Queues & Deques** | **10** |

**Queues:** Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.

**Deques:** Introduction to deques (double-ended queues), Operations on deques and their applications

| | | |
|---|---|---|
| **Unit- V** | | **10** |

Trees: Introduction to Trees, Binary Tree-Insertion, Deletion & Traversal, Binary Search Tree – Insertion, Deletion & Traversal, Introduction to Graphs, Graph Traversals – BFS,DFS.

**Hashing: Brief** introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

**Textbooks:**

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, $2^{nd}$ Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

**Reference Books:**

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and PeterSanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E.Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and DavidRanum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching,and Graph Algorithms" by Robert Sedgewick

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### B.Tech I Year II Semester

| ENGINEERING PHYSICS LAB (Common to all branches) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0006P** | **0:0:2** | **1** | **CIE: 30 SEE:70** | **3 Hours** | **BS** |

**Course Objectives:**

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments

**Course Outcomes (CO):**

**CO1:** Operate optical instruments like travelling microscope and spectrometer.
**CO2:** Estimate dielectric constant of capacitor and magnetic induction of current carrying coil
**CO3:** Identify the type of semiconductor and calculate band gap of it.
**CO4:** Evaluate different modulus of materials.
**CO5:** Measure the frequency of tuning fork and verify the laws in Sonometer

| Syllabus | Total Hours:48 |
|---|---|

**List of Experiments**

1. Determination of radius of curvature of a given plano convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using
3. diffraction grating in normal incidence configuration.
4. Verification of Brewster's law
5. Determination of wavelength of Laser light using diffraction grating.
6. Estimation of Planck's constant using photoelectric effect.
7. Magnetic field along the axis of a current carrying circular coil by Stewart Gee'sMethod.
8. Determination of dielectric constant using charging and discharging method.
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10. Determination of magnetic susceptibility by Kundt's tube method.
11. Determination of the resistivity of semiconductors by four probe methods.
12. Determination of energy gap of a semiconductor using p-n junction diode.
13. Determination of Hall voltage and Hall coefficient of a given semiconductor usingHall Effect.
14. Determination of temperature coefficients of a thermistor.
15. Determination of rigidity modulus of the material of the given wire using Torsionalpendulum.
16. Determination of young's modulus for the given material of wooden scale by non- uniform bending (or double cantilever) method.
17. Determination of Frequency of electrically maintained tuning fork by Melde'sexperiment.
18. Sonometer : Verification of laws of stretched string.
19. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum

**Note:** Any **TEN** of the listed experiments are to be conducted. Out of which any **TWO** experiments may be conducted in virtual mode.

**Textbooks:**

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn.2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 &2017.

**Reference Books:**

1. A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. ChandPublishers, 2017.

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**B.Tech I Year II Semester**

**ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP**
**(Common to all branches)**

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0202P | 0:0:3 | 1.5 | CIE: 30 SEE:70 | 3 Hours | ES |

**Course Objectives:**

- To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations

**Course Outcomes (CO):**

**CO1:** Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.

**CO2:** Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.

**CO3:** Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.

**CO4:** Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.

**CO5:** Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

| Syllabus | Total Hours:48 |
|---|---|

**Activities:**

- Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
- Provide some exercises so that hardware tools and instruments are learned to be usedby the students.
- Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
- Provide some exercises so that measuring instruments are learned to be used by thestudents.
- Components:
- Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc
- Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

**PART A: ELECTRICAL ENGINEERING LAB**

**List of experiments:**

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator

5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

**Reference Books:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, FirstEdition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti,Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, ThirdEdition

## PART B: ELECTRONICS ENGINEERING LAB
## (Common to all branches)

**Course Objectives:**

To impart knowledge on the principles of digital electronics and fundamentals ofelectron devices & its applications

**Course Outcomes (CO):**

At the end of the course, the student will be able to:
**CO1:** Identify & testing of various electronic components.
**CO2:** Understand the usage of electronic measuring instruments.
**CO3:** Plot and discuss the characteristics of various electron devices.
**CO4:** Explain the operation of a digital circuit

| Syllabus | Total Hours:48 |
|---|---|

**List of Experiments:**

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gatesusing ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

**Tools / Equipment Required:** DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters,AC Voltmeters, CROs, all the required active devices.

**Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.**

**Reference Books:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.
2. R. P. Jain, Modern Digital Electronics, $4^{th}$ Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, IntroductoryElectronic Devices & Circuits – Conventional Flow Version,Pearson Education, 2009.

**B.Tech I Year II Semester**

| DATA STRUCTURES LAB (Common to CSE, AI&ML, DS, CS, CE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0505P** | **0:0:3** | **1.5** | **CIE: 30 SEE:70** | **3 Hours** | **PC** |

**Course Objectives:**

- The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO1:** Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.

**CO2:** Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.

**CO3:** Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

**CO4:** Apply queue-based algorithms for efficient task scheduling and breadth-first traversal ingraphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.

**CO5:** Recognize scenarios where hashing is advantageous, and design hash-based solutions forspecific problems.

**Syllabus**

**Exercise 1: Array Manipulation**

i) Write a program to reverse an array.
ii) C Programs to implement the Searching Techniques – Linear & Binary Search
iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

**Exercise 2: Linked List Implementation**

i) Implement a singly linked list and perform insertion and deletion operations.
ii) Develop a program to reverse a linked list iteratively and recursively.
iii) Solve problems involving linked list traversal and manipulation.

**Exercise 3: Linked List Applications**

i) Create a program to detect and remove duplicates from a linked list.
ii) Implement a linked list to represent polynomials and perform addition.
iii) Implement a double-ended queue (deque) with essential operations.

**Exercise 4: Double Linked List Implementation**

i) Implement a doubly linked list and perform various operations to understand its properties and applications.
ii) Implement a circular linked list and perform insertion, deletion, and traversal

**Exercise 5: Stack Operations**

i) Implement a stack using arrays and linked lists.
ii) Write a program to evaluate a postfix expression using a stack.
iii) Implement a program to check for balanced parentheses using a stack.

**Exercise 6: Queue Operations**

i) Implement a queue using arrays and linked lists.
ii) Develop a program to simulate a simple printer queue system.
iii) Solve problems involving circular queues.

**Exercise 7: Stack and Queue Applications**

i) Use a stack to evaluate an infix expression and convert it to postfix.
ii) Create a program to determine whether a given string is a palindrome or not.
iii) Implement a stack or queue to perform comparison and check for symmetry.

**Exercise 8**: Binary Tree

i) Implementing a Binary tree using Linked List
ii) Traversing of Binary tree

**Exercise 9: Binary Search Tree**

i) Implementing a BST using Linked List.
ii) Traversing of BST.

**Exercise 10: Hashing**

i) Implement a hash table with collision resolution techniques.
ii) Write a program to implement a simple cache using hashing.

**Textbooks:**

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

**Reference Books:**

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and PeterSanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and DavidRanum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching,and Graph Algorithms by Robert Sedgewick.

**Web Resources**:

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**B.Tech I Year II Semester**

**NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE**
**(Common to all branches)**

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23ANS01P | 0:0:1 | 0.5 | CIE: 30 SEE:70 | 3 Hours | BS |

**Course Objectives:**

- The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

**Course Outcomes (CO):**

On completion of this course, the students are able to:
**CO-1:** Understand the importance of discipline, character and service motto
**CO-2:** Solve some societal issues by applying acquired knowledge, facts, and techniques.
**CO-3:** Explore human relationships by analyzing social problems.
**CO-4:** Determine to extend their help for the fellow beings and downtrodden people.
**CO-5:** Develop leadership skills and civic responsibilities.

**Syllabus**

**Unit- I**

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.
**Activities**:
iv) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
v) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
vi) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
vii) Conducting talent show in singing patriotic songs-paintings- any other contribution

**Unit- II**

**Activities:**
i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
Write a summary on any book related to environmental issues.

**Unit- III**

**Activities:**
iii) Conducting One Day Special Camp in a village contacting village-area leaders Survey in the village, identification of problems- helping them to solve via media authorities-experts-etc.
iv) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
v) Conducting consumer Awareness. Explaining various legal provisions etc.
vi) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
vii) Any other programmes in collaboration with local charities, NGOs etc

**Reference Books:**

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service SchemeVol;.I, Vidya Kutir Publication, 2021 ( ISBN 978-81-952368-8-6)

2. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., “Introduction to Environmental Engineering”, McGraw Hill, New
4. York 4/e 2008Masters G. M., Joseph K. and Nagendran R. “Introduction to Environmental Engineering and Science”, Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.


**General Guidelines:**

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students

**Evaluation Guidelines:**

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject

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| **II Year I Semester (Theory-5, Lab-2, SC-1, MC-1)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | BS | 23A0015T | Discrete Mathematics & Graph Theory | 3 | 0 | 0 | 3 |
| 2 | HS | 23A0021T | Universal Human Values 2 Understanding Harmony and Ethical human conduct | 2 | 1 | 0 | 3 |
| 3 | ES | 23A0406T | Digital Logic and Computer Organization | 3 | 0 | 0 | 3 |
| 4 | PC | 23A0506T | Advanced Data Structures & Algorithm Analysis | 3 | 0 | 0 | 3 |
| 5 | PC | 23A0507T | Object-Oriented Programming Through JAVA | 3 | 0 | 0 | 3 |
| 6 | PC | 23A0508P | Advanced Data structures and Algorithms Analysis Lab | 0 | 0 | 3 | 1.5 |
| 7 | PC | 23A0509P | Object-Oriented Programming Through JAVA Lab | 0 | 0 | 3 | 1.5 |
| 8 | SE | 23A0510P | Python programming | 0 | 1 | 2 | 2 |
| 9 | MC | 23A0025T | Environmental Science | 2 | 0 | 0 | - |
| | | | Total | **15** | **2** | **10** | **20** |

| **Category** | **Credits** |
|---|---|
| Basic Science Course (BS) | 3 |
| Professional Core Courses (PC) | 9 |
| Engineering Science Courses (ES) | 3 |
| Humanities and Social Science Course (HS) | 3 |
| Skill Enhancement Course (SE) | 2 |
| Mandatory Course(MC) | - |
| Total | 20 |

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**B.Tech II Year I Semester**

**DISCRETE MATHEMATICS & GRAPH THEORY**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0015T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | BS |

**Course Objectives:**

This course will enable students to:

- To introduce the concepts of mathematical logic
- To introduce the concepts of sets, relations, and functions.
- To perform the operations associated with sets, functions, and relations.
- To introduce generating functions and recurrence relations.
- To relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
- To use Graph Theory for solving problems.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Apply mathematical logic to solve problems.
- Understand the concepts and perform the operations related to sets, relations and functions.
- Gain the conceptual background needed and identify structures of algebraic nature.
- Apply basic counting techniques to solve combinatorial problems.
- Formulate problems and solve recurrence relations.
- Apply Graph Theory in solving computer science problems

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Mathematical Logic** | **9Hrs** |

**Mathematical Logic**: Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus

| | | |
|---|---|---|
| **Unit-II** | **Set theory and algebraic structures** | **10Hrs** |

**Set theory**: Sets and its operations, The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. **Algebraic structures**: Algebraic Systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism...

| | | |
|---|---|---|
| **Unit-III** | **Elementary Combinatorics** | **10Hrs** |

Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

| | | |
|---|---|---|
| **Unit-IV** | **Recurrence Relations** | **10Hrs** |

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous, Recurrence Relations.

| Unit-V | Graphs | 9Hrs |
|---|---|---|
| Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs | | |

**Text Books:**

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.
2. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatoricsand Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.

**Reference Books:**

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science.

**Web References:**

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

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**B.Tech II Year I Semester**

**UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY ANDETHICAL HUMAN CONDUCT**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0021T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | HS |

**Course Objectives:**

This course will enable students to:

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Define the terms like Natural Acceptance, Happiness and Prosperity.
- Identify one’s self, and one’s surroundings (family, society nature)
- Apply what they have learnt to their own self in different day-to-day settings in real life.
- Relate human values with human relationship and human society.
- Justify the need for universal human values and harmonious existence
- Develop as socially and ecologically responsible engineers

**Course Topics**

**Course Topics**

The course has 28 lectures and 14 tutorials in 5 Units. The lectures and tutorials are of 1- hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher’s Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction to Value Education (6 lectures and 3 tutorials for practice session)** | **9Hrs** |

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

| Unit-II | Harmony in the Human Being (6 lectures and 3 tutorials for practice session) | 10Hrs |
|---|---|---|

Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

| Unit-III | Harmony in the Family and Society (6 lectures and 3 tutorials for practice session) | 10Hrs |
|---|---|---|

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture 16: Other Feelings, Justice in Human-to-Human Relationship Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfill Human Goal.

| Unit-IV | Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session) | 10Hrs |
|---|---|---|

Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

| Unit-V | Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session) | 9Hrs |
|---|---|---|

Lecture 23: Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order
Practice Sessions for UNIT I – Introduction to Value Education PS1 Sharing about Oneself
PS2 Exploring Human Consciousness PS3 Exploring Natural Acceptance

Practice Sessions for UNIT III – Harmony in the Family and Society PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence) PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

**Mode of Conduct:**

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self- exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

**Text Books:**

a. The Textbook

R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and ProfessionalEthics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

b. The Teacher's Manual

R R Gaur, R Asthana, G P Bagaria,*Teachers' Manual for A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

**Reference Books:**

1. *JeevanVidya: EkParichaya*, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. *Human Values*, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. *The Story of Stuff* (Book).
4. *The Story of My Experiments with Truth* - by Mohandas Karamchand Gandhi
5. *Small is Beautiful* - E. F Schumacher.
6. *Slow is Beautiful* - Cecile Andrews
7. *Economy of Permanence* - J C Kumarappa
8. *Bharat Mein Angreji Raj* – PanditSunderlal
9. *Rediscovering India* - by Dharampal
10. *Hind Swaraj or Indian Home Rule* - by Mohandas K. Gandhi
11. *India Wins Freedom* - Maulana Abdul Kalam Azad
12. *Vivekananda* - Romain Rolland (English)
13. *Gandhi* - Romain Rolland (English).

**Web References:**


**1.** https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf

**2.** https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf

**3.** https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf

**4.** https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf

**5.** https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf

**6.** https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf

**7.** https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf

**8.** https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385

**9.** https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

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**B.Tech II Year I Semester**

## DIGITAL LOGIC & COMPUTER ORGANIZATION
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0406T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | ES |

**Course Objectives:**

**This course will enable students to:**

- provide students with a comprehensive understanding of digital logic designprinciples and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Differentiate between combinational and sequential circuits based on their characteristics and functionalities.
- Demonstrate an understanding of computer functional units.
- Analyze the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms, to comprehend their role in computer systems.
- Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability.
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques.
- Design Sequential and Combinational Circuits

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Data Representation** | **9Hrs** |

**Data Representation:** Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes

**Digital Logic Circuits-I:** Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

| | | |
|---|---|---|
| **Unit-II** | **Digital Logic Circuits** | **10Hrs** |

**Digital Logic Circuits-II:** Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

**Basic Structure of Computers**: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture

| | | |
|---|---|---|
| **Unit-III** | **Computer Arithmetic** | **10Hrs** |

**Computer Arithmetic**: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.

**Processor Organization**: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

| Unit-IV | The Memory Organization | 10Hrs |
|---|---|---|
| Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage | | |
| **Unit-V** | **Input /Output Organization** | **9Hrs** |
| Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces, Arbitration | | |

**Text Books:**

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill, 2023.
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education, 2018.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson,2022.

**Reference Books:**

1. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson, 2017.
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier,2004.
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson, 2003.

**Web References:**

1. https://nptel.ac.in/courses/106/103/106103068/

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**B.Tech II Year I Semester**

**ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0506T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

This course will enable students to:

- provide knowledge on advance data structures frequently used in Computer Sciencedomain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Illustrate the working of the advanced tree data structures and their applications.
- Understand the Graph data structure, traversals and apply them in various contexts.
- Use various data structures in the design of algorithms.
- Recommend appropriate data structures based on the problem being solved.
- Analyze algorithms with respect to space and time complexities.
- Design new algorithms

| | Syllabus | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction** | **9Hrs** |

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.
AVL Trees – Creation, Insertion, Deletion operations and Applications
B-Trees – Creation, Insertion, Deletion operations and Applications

| | | |
|---|---|---|
| **Unit-II** | **Heap Trees (Priority Queues)** | **10Hrs** |

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications
Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Bi connected Components, applications
Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

| | | |
|---|---|---|
| **Unit-III** | **Greedy Method** | **10Hrs** |

**Greedy Method**: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths
**Dynamic Programming**: General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

| | | |
|---|---|---|
| **Unit-IV** | **Backtracking & Branch and Bound** | **10Hrs** |

**Backtracking**: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem (Hamiltonian Cycle)
**Branch and Bound**: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

| Unit-V | P and NP Problems | 9Hrs |
|---|---|---|

NP Hard and NP Complete Problems: Basic Concepts, Satisfiability Problem, Cook's theorem
NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)
NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

**Text Books:**

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta,Dinesh 2nd Edition Universities Press

**Reference Books:**

1. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran2ndEdition University Press.(added to reference).
2. Data Structures and program design in C, Robert Kruse, Pearson Education Asia.
3. An introduction to Data Structures with applications, Trembley & Sorenson, McGrawHill.
4. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
5. Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995.
6. Algorithms + Data Structures &Programs: N.Wirth, PHI.
7. Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta, Galgottia Pub.
8. Data structures in Java: Thomas Standish, Pearson Education Asia.

**Web References:**

1. https://onlinecourses.swayam2.ac.in/cec20_cs03/preview
2. https://www.tutorialspoint.com/advanced_data_structures/index.asp
3. http://peterindia.net/Algorithms.html
4. Abdul Bari,1. Introduction to Algorithms (youtube.com)

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**B.Tech II Year I Semester**

| OBJECT-ORIENTED PROGRAMMING THROUGH JAVA (Common to CSE, AI&ML, DS, CS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L: T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0507T** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **PC** |

**Course Objectives:**

**This course will enable students to:**

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java apis for program development

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Analyze problems, design solutions using OOP principles, and implement them efficiently in Java
- Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects
- Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.
- Apply Competence in handling exceptions and errors to write robust and fault-tolerant code
- Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.
- Choose appropriate data structure of Java to solve a problem

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Object Oriented Programming** | **9Hrs** |

**Object Oriented Programming:** Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

**Data Types**, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final,

**Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator ( = ), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

**Control Statements**: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

| Unit-II | Classes and Objects & Methods | 10Hrs |
|---|---|---|

**Classes and Objects:** Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this. Abstract Class

**Methods:** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

| Unit-III | Arrays | 10Hrs |
|---|---|---|

**Arrays**: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

**Inheritance:** Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class- Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

**Interfaces:** Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

| Unit-IV | Packages and Java Library | 10Hrs |
|---|---|---|

**Packages and Java Library**: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto- unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

**Exception Handling**: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

**Java I/O and File**: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

| Unit-V | String Handling in Java | 9Hrs |
|---|---|---|

Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

**Multithreaded Programming:** Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

**Java Database Connectivity:** Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface

**Java FX GUI:** Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

**Text Books:**

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

**Reference Books:**

1. The complete Reference Java, 11thedition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

**Web References:**

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

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**B.Tech II Year I Semester**

**ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0508P | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

**This course will enable students to:**

- Acquire practical skills in constructing and managing Data structures
- Apply the popular algorithm design methods in problem-solving scenarios

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Design and develop programs to solve real world problems with the popular algorithm design methods
- Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs
- Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications.
- Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems
- Compare the performance of different of algorithm design strategies
- Design algorithms to new real world problems

**Experiments covering the Topics:**

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

**Sample Programs:**

**Week-1:**

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.

Week-2:

2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.

Week-3:

3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.

Week-4:

4. Implement BFT and DFT for given graph, when graph is represented by
   a) Adjacency Matrix b) Adjacency Lists

Week-5:

5. Write a program for finding the bi-connected components in a given graph.

Week-6:

6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).

Week-7:

7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists

Week-8:

8. Implement Job sequencing with deadlines using Greedy strategy.

Week-9:

9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.

Week-10:

10. Implement N-Queens Problem Using Backtracking.

Week-11:

11. Use Backtracking strategy to solve 0/1 Knapsack problem.

Week-12:

12. Implement Travelling Sales Person problem using Branch and Bound approach

**Reference Books:**

1. Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2ndEdition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2ndEdition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

**Web References:**

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html
3. https://onlinecourses.swayam2.ac.in/cec20_cs03/preview

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**B.Tech II Year I Semester**

## OBJECT-ORIENTED PROGRAMMING THROUGH JAVA LAB
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0509P | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

**The aim of this course is to:**

- Practice object-oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Demonstrate a solid understanding of Java syntax, including data types, controlstructures, methods, classes, objects, inheritance, polymorphism, and exceptionhandling.
- Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively.
- Familiar with commonly used Java libraries and APIs, including the CollectionsFramework, Java I/O, JDBC, and other utility classes.
- Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges.
- Proficiently construct graphical user interface (GUI) applications using JavaFX.
- Develop new programs for solving typical computer science problems.

**Experiments covering the Topics:**

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

**Sample Programs:**

**Week-1:**

1. Develop a java program to display default value of all primitive data type of JAVA
2. Develop a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Week-2:

3. Develop a JAVA program to search for an element in a given list of elements using binary search mechanism.
4. Develop a JAVA program to sort for an element in a given list of elements using bubble sort

Week-3:

5. Develop a JAVA program using StringBuffer to delete, remove character.

Week-4:

6. Develop a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
7. Develop a JAVA program implement method overloading.

Week-5:

8. Write a JAVA program to implement constructor.
9. Write a JAVA program to implement constructor overloading.

Week-6:

10. Write a JAVA program to implement Single Inheritance
11. Write a JAVA program to implement multi level Inheritance

Week-7:

12. Write a JAVA program for abstract class to find areas of different shapes
13. Write a JAVA program give example for “super” keyword.

Week-8:

14. Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
15. Write a JAVA program that implements Runtime polymorphism

Week-9:

16. Write a JAVA program that describes exception handling mechanism
17. Write a JAVA program Illustrating Multiple catch clauses

Week-10:

18. Write a JAVA program for creation of Java Built-in Exceptions
19. Write a JAVA program for creation of User Defined Exception

Week-11:

20. Write a JAVA program that creates threads by extending Thread class. First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds, (Repeat the same by implementing Runnable)
21. Write a program illustrating is Alive and join ()

Week-12**:**

22. Write a Program illustrating Daemon Threads.
23. Write a JAVA program Producer Consumer Problem

Week-13:

24. Write a JAVA program that import and use the user defined packages
25. Without writing any code, build a GUI that display text in label and image in anImageView (use JavaFX)

Week-14:

26. Build a Tip Calculator app using several JavaFX components and learn how torespond to user interactions with the GUI
27. Write a java program that connects to a database using JDBC

Week-15:

28. Write a java program to connect to a database using JDBC and insert values into it.
29. Write a java program to connect to a database using JDBC and delete values from it

**Text Books:**


1 Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2nd Edition, Universities Press

2 Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition, University Press

3 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

4 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill


**Reference Books:**


1. The complete Reference Java, 11th edition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson


**Web References:**


1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046 4547 618816347_shared/overview

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**B.Tech II Year I Semester**

**PYTHON PROGRAMMING**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0510P | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | SE |

**Course Objectives:**

**This course will enable students to:**

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programmingand to create practical and contemporary applications using these

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Classify data structures of Python
- Apply Python programming concepts to solve a variety of computational problems
- Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs
- Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas
- Exhibit competence in implementing and manipulating fundamental data structuressuch as lists, tuples, sets, dictionaries
- Propose new solutions to computational problems

| Syllabus | | Total Hours:48 |
|---|---|---|
| Unit-I | History of Python Programming Language | 9Hrs |

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

**Parts of Python Programming Language:** Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type ( ) Function and Is Operator, Dynamic and Strongly Typed Language.

**Control Flow Statements:** if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

**Sample Experiments:**

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators
   iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators
   viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

| Unit-II | Functions, Strings, Lists | 10Hrs |
|---|---|---|

**Functions:** Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

**Strings**: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

**Lists**: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

**Sample Experiments:**

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list:
    **i. Addition** **ii. Insertion** **iii. Slicing**
12. Write a program to perform any 5 built-in functions by taking any list.

| Unit-III | Dictionaries | 10Hrs |
|---|---|---|

**Dictionaries:** Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

**Tuples and Sets:** Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

**Sample Experiments:**

13. Write a program to create tuples (name, age, address, college) for at least two membersand concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

| Unit-IV | Files | 10Hrs |
|---|---|---|

**Files:** Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

**Sample Experiments:**

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

| Unit-V | Introduction to Data Science | 9Hrs |
|---|---|---|

**Introduction to Data Science:** Functional Programming, JSON and XML in Python, NumPy with Python, Pandas

**Sample Experiments:**

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array ( ) function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a) Apply head ( ) function to the pandas data frame
    b) Perform various data selection operations on Data Frame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

**Text Books:**

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press

**Reference Books:**

1. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson,2024
2. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

**Web References:**

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

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**B.Tech II Year I Semester**

**ENVIRONMENTAL SCIENCE**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0025T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | MC |

**Course Objectives:**

**This course will enable students to:**

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers

**Course Outcomes(CO):**

**On completion of this course, student will be able to**

- No Outcomes

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Multidisciplinary Nature of Environmental Studies** | **9Hrs** |

**Multidisciplinary Nature of Environmental Studies: –** Definition, Scope and Importance – Need for Public Awareness.

**Natural Resources :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

| **Unit-II** | **Ecosystems** | **10Hrs** |
|---|---|---|

**Ecosystems:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem.
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation : Introduction0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports 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 conservation of biodiversity.

| Unit-III | Environmental Pollution | 10Hrs |
|---|---|---|

**Environmental Pollution:** Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

**Solid Waste Management:** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

| Unit-IV | Social Issues and the Environment | 10Hrs |
|---|---|---|

**Social Issues and the Environment:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness**.**

| Unit-V | Human Population and the Environment | 9Hrs |
|---|---|---|

**Human Population and the Environment:** Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**Field Work:** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

**Text Books:**

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S.Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.

**Reference Books:**

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”,Cengage Publications.
2. M.Anji Reddy, “Text book of Environmental Sciences and Technology”, BSPublication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, “Environmental Sciences and Engineering”, Prentice hall of India Private limited
5. G.R.Chatwal, “A Text Book of Environmental Studies” Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, “Introduction to Environmental Engineeringand Science, Prentice hall of India Private limited.

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| **II Year II Semester (Theory-6, Lab-3, SC-1, MC-1)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | HS | 23A0022T<br><br>23A0023T<br>23A0024T | Managerial Economics and Financial Analysis<br>Organizational Behavior<br>Business Environment | 2 | 0 | 0 | 2 |
| 2 | BS | 23A0017T | Probability & Statistics | 3 | 0 | 0 | 3 |
| 3 | PC | 23A0511T | Operating Systems | 3 | 0 | 0 | 3 |
| 4 | PC | 23A0512T | Database Management Systems | 3 | 0 | 0 | 3 |
| 5 | PC | 23A0513T | Software Engineering | 3 | 0 | 0 | 3 |
| 6 | PC | 23A0514P | Operating Systems Lab | 0 | 0 | 3 | 1.5 |
| 7 | PC | 23A0515P | Database Management Systems Lab | 0 | 0 | 3 | 1.5 |
| 8 | SE | 23A0516P | Full Stack Development-1 | 0 | 1 | 2 | 2 |
| 9 | HS | 23A0413T | Design Thinking & Innovation | 0 | 1 | 2 | 2 |
| | | | Total credits | | | | **21** |
| Mandatory Community Service Project of 08 weeks duration during summer vacation | | | | | | | |

| **Category** | **Credits** |
|---|---|
| Basic Science Course (BS) | 3 |
| Professional Core Courses (PC) | 12 |
| Skill Enhancement Course (SE) | 2 |
| Humanities and Social Science Course (HS) | 4 |
| Total | 21 |

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**B.Tech II Year II Semester**

**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0022T | 2:0:0:0 | 2 | CIE: 30 SEE:70 | 3 Hours | HS |

**Course Objectives:**

This course will enable students to:
- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learnhow to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

**Course Outcomes(CO):**

**On completion of this course, student will be able to**
- Define the concepts related to Managerial Economics, financial accounting and management(L2)
- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)
- Apply the Concept of Production cost and revenues for effective Business decision(L3)
- Analyze how to invest their capital and maximize returns (L4)
- Evaluate the capital budgeting techniques. (L5)
- Develop the accounting statements and evaluate the financial performance of businessentity (L5)

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Managerial Economics** | **9Hrs** |

**Introduction** – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting-Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

| | | |
|---|---|---|
| **Unit-II** | **Production and Cost Analysis** | **10Hrs** |

**Introduction** – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

| | | |
|---|---|---|
| **Unit-III** | **Business Organizations and Markets** | **10Hrs** |

**Introduction** – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies

| | | |
|---|---|---|
| **Unit-IV** | **Capital Budgeting** | **10Hrs** |

**Introduction** – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

| Unit-V | Financial Accounting and Analysis | 9Hrs |
|---|---|---|
| Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability. | | |

**Text Books:**

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

**Reference Books:**

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, NewAge International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e,New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

**Web References:**

1. https://www.slideshare.net/123ps/managerial-economics-ppt
2. https://www.slideshare.net/rossanz/production-and-cost-45827016
3. https://www.slideshare.net/darkyla/business-organizations-19917607
4. https://www.slideshare.net/balarajbl/market-and-classification-of-market
5. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6. https://www.slideshare.net/ashu1983/financial-ccounting

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**B.Tech II Year II Semester**

| ORGANISATIONAL BEHAVIOUR (Common to CSE, AI&ML, DS, CS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0023T** | **2:0:0:0** | **2** | **CIE: 30 SEE:70** | **3 Hours** | **HS** |

**Course Objectives:**

This course will enable students to:

- To enable student's comprehension of organizational behavior
- To offer knowledge to students on self-motivation, leadership and management
- To facilitate them to become powerful leaders
- To Impart knowledge about group dynamics
- To make them understand the importance of change and development

**Course Outcomes(CO):**

**On completion of this course, student will be able to**

- Define the Organizational Behaviour, its nature and scope. (L2)
- Understand the nature and concept of Organizational behaviour (L2)
- Apply theories of motivation to analyse the performance problems (L3)
- Analyse the different theories of leadership (L4)
- Evaluate group dynamics (L5)
- Develop as powerful leader (L5)

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction to Organizational Behavior** | **9Hrs** |

Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual Behaviour –Attitude -Perception - Learning – Personality.

| **Unit-II** | **Motivation and Leading** | **10Hrs** |
|---|---|---|

Theories of Motivation- Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Cleland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory.

| **Unit-III** | **Organizational Culture** | **10Hrs** |
|---|---|---|

Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader.

| **Unit-IV** | **Group Dynamics** | **10Hrs** |
|---|---|---|

Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behaviour - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building - Conflict in the organization– Conflict resolution

| **Unit-V** | **Organizational Change and Development** | **9Hrs** |
|---|---|---|

Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

**Text Books:**

1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12 Th edition.
2. P Subba Ran, Organisational Behaviour, Himalya Publishing House.
3. Reference Books:
4. McShane, Organizational Behaviour, TMH
5. Nelson, Organisational Behaviour, Thomson.
6. Robbins, P. Stephen, Timothy A. Judge, Organisational Behaviour, Pearson.
7. Aswathappa, Organisational Behaviour, Himalaya.

**Web References:**

1. https://www.slideshare.net/Knight1040/organizational-culture 9608857
2. https://www.slideshare.net/AbhayRajpoot3/motivation-165556714
3. https://www.slideshare.net/harshrastogi1/group-dynamics-159412405
4. https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951

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## B.Tech II Year II Semester

**BUSINESS ENVIRONMENT**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0024T | 2:0:0:0 | 2 | CIE: 30 SEE:70 | 3 Hours | HS |

**Course Objectives:**

This course will enable students to:
- To make the student to understand about the business environment
- To enable them in knowing the importance of fiscal and monitory policy
- To facilitate them in understanding the export policy of the country
- To Impart knowledge about the functioning and role of WTO
- To Encourage the student in knowing the structure of stock markets

**Course Outcomes(CO):**

**On completion of this course, student will be able to**
- Define Business Environment and its Importance. (L2)
- Understand various types of business environment. (L2)
- Apply the knowledge of Money markets in future investment (L3)
- Analyse India’s Trade Policy (L4)
- Evaluate fiscal and monitory policy (L5)
- Develop a personal synthesis and approach for identifying business opportunities(L5)

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Overview of Business Environment** | **9Hrs** |

Introduction – meaning Nature, Scope, significance, functions and advantages. Types- Internal &External, Micro and Macro. Competitive structure of industries -Environmentalanalysis- advantages & limitations of environmental analysis.

| | | |
|---|---|---|
| **Unit-II** | **Fiscal & Monetary Policy** | **10Hrs** |

Introduction – Nature, meaning, significance, functions and advantages. Public Revenues -Public Expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget- Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and creditpolicy - Recent trends- Role of Finance Commission.

| | | |
|---|---|---|
| **Unit-III** | **India’s Trade Policy** | **10Hrs** |

Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

| | | |
|---|---|---|
| **Unit-IV** | **World Trade Organization** | **10Hrs** |

Introduction – Nature, significance, functions and advantages. Organization and Structure -Role and functions of WTO in promoting world trade - GATT -Agreements in the Uruguay Round – TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

| | | |
|---|---|---|
| **Unit-V** | **Money Markets and Capital Markets** | **9Hrs** |

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI, Introduction to international finance.

**Text Books:**

1. Francis Cherunilam, International Business: Text and Cases, Prentice Hall of India.
2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH

**Reference Books:**

3. K. V. Sivayya, V. B. M Das, Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
4. Sundaram, Black, International Business Environment Text and Cases, Prentice Hall ofIndia, New Delhi, India.
5. Chari. S. N, International Business, Wiley India.
6. E. Bhattacharya, International Business, Excel Publications, New Delhi.

**Web References:**

1. https://www.slideshare.net/ShompaDhali/business-environment-53111245
2. https://www.slideshare.net/rbalsells/fiscal-policy-ppt
3. https://www.slideshare.net/aguness/monetary-policy-presentationppt
4. https://www.slideshare.net/DaudRizwan/monetary-policy-of-india69561982
5. https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt
6. https://www.slideshare.net/viking2690/wto-ppt-60260883
7. https://www.slideshare.net/prateeknepal3/ppt-mo

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**Unit of USHODAYA EDUCATIONAL SOCIETY**
An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
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**B.Tech II Year II Semester**

**PROBABILITY & STATISTICS**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0017T | 2:0:0:0 | 2 | CIE: 30 SEE:70 | 3 Hours | BS |

**Course Objectives:**

This course will enable students to:

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Acquire knowledge in finding the analysis of the data quantitatively or categorically and various statistical elementary tools.
- Develop skills in designing mathematical models involving probability, random variables and the critical thinking in the theory of probability and its applications in real life problems.
- Apply the theoretical probability distributions like binomial, Poisson, and Normalin the relevant application areas.
- Analyze to test various hypotheses included in theory and types of errors for large samples.
- Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Descriptive statistics** | **9Hrs** |
| Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Measures of Central tendency, Measures of Variability (spread or variance) Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, methodof least squares, regression lines. | | |
| **Unit-II** | **Probability** | **10Hrs** |
| Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation. | | |
| **Unit-III** | **Probability distributions** | **10Hrs** |
| Probability distributions: Binomial, Poisson and Normal-their properties (Chebyshev's inequality). Approximation of the binomial distribution to normal distribution. | | |
| **Unit-IV** | **Estimation and Testing of hypothesis, large sample tests** | **10Hrs** |
| Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems | | |
| **Unit-V** | **Small sample tests** | **9Hrs** |
| Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes. | | |

**Text Books:**

1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, SultanChand & Sons Publications, 2012.

**Reference Books:**

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley,1968.
3. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

**Web References:**

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

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**B.Tech II Year II Semester**

**OPERATING SYSTEMS**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0511T | 2:0:0:0 | 2 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

This course will enable students to:

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achievebetter performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

**Course Outcomes(CO):**

**On completion of this course, student will be able to**

- Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication. (L1)
- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection. (L2)
- Make use of process scheduling algorithms and synchronization techniques to achievebetter performance of a computer system. (L3)
- Illustrate different conditions for deadlock and their possible solutions. (L2)
- Analyze the memory management and its allocation policies. (L4)

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Operating Systems Overview** | **9Hrs** |

**Operating Systems Overview**: Introduction, Operating system functions, Types of Operating systems, Operating systems operations, Computing environments, Free and Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, system calls,

Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

| | | |
|---|---|---|
| **Unit-II** | **Processes & Scheduling** | **10Hrs** |

**Processes**: Process Concept, Process scheduling, Operations on processes, Inter-process communication.

Threads and Concurrency: Multithreading models, Thread libraries, Threading issues.

**CPU Scheduling**: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

| | | |
|---|---|---|
| **Unit-III** | **Synchronization Tools & Deadlocks** | **10Hrs** |

**Synchronization Tools**: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization.

**Deadlocks**: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock

| Unit-IV | Management Strategies | 10Hrs |
|---|---|---|
| **Memory-Management Strategies:** Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.<br>**Virtual Memory Management:** Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing.<br>**StorageManagement:** Overview of Mass Storage Structure, HDD Scheduling. | | |
| **Unit-V** | **File System** | **9Hrs** |
| **File System: File System Interface**: File concept, Access methods, Directory Structure;<br>**File system Implementation**: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management;<br>**File-System Internals**: File- System Mounting, Partitions and Mounting, File Sharing.<br>**Protection**: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix. | | |

**Text Books:**

1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition,Wiley, 2018.

**Reference Books:**

1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw-Hill, 2013
3. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016

**Web References:**

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

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**B.Tech II Year II Semester**

| **DATABASE MANAGEMENT SYSTEMS** (Common to CSE, AI&ML, DS, CS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0512T** | **2:0:0:0** | **2** | **CIE: 30 SEE:70** | **3 Hours** | **PC** |

**Course Objectives:**

This course will enable students to:
- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

**Course Outcomes(CO):**

**On completion of this course, student will be able to**
- Understand the basic concepts of database management systems (L2)
- Analyze a given database application scenario to use ER model for conceptual designof the database (L4)
- Utilize SQL proficiently to address diverse query challenges (L3).
- Employ normalization methods to enhance database structure (L3)
- Assess and implement transaction processing, concurrency control and databaserecovery protocols in databases. (L4)

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Introduction** | **9Hrs** |

**Introduction:** Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

| **Unit-II** | **Relational Model** | **10Hrs** |
|---|---|---|

**Relational Model:** Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL:Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

| **Unit-III** | **SQL** | **10Hrs** |
|---|---|---|

**SQL:**Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

| Unit-IV | Schema Refinement | 10Hrs |
|---|---|---|
| **Schema Refinement (Normalization):** Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).DeNormalization | | |
| **Unit-V** | **Transaction Concept** | **9Hrs** |
| **Transaction Concept:** Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.<br>Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing: | | |

**Text Books:**

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke,TMH (For Chapters 2, 3, 4)
2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (ForChapter 1 and Chapter 5)

**Reference Books:**

1. Introduction to Database Systems, 8thedition, C J Date, Pearson.
2. Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management,Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

**Web References:**

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0127580666728202 2456_shared/overview

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**B.Tech II Year II Semester**

| SOFTWARE ENGINEERING (Common to CSE, AI&ML, DS, CS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0513T** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **PC** |

**Course Objectives:**

This course will enable students to:

- Software life cycle models, Software requirements and SRS document.
- Project Planning, quality control and ensuring good quality software.
- Software Testing strategies, use of CASE tools, Implementation issues, validation & verification procedures.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Perform various life cycle activities like Analysis, Design, Implementation, Testingand Maintenance (L3)
- Analyse various software engineering models and apply methods for design and development of software projects. (L4)
- Develop system designs using appropriate techniques. (L3)
- Understand various testing techniques for a software project. (L2)
- Apply standards, CASE tools and techniques for engineering software projects (L3)

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Introduction** | **9Hrs** |

**Introduction**: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

**Software Life Cycle Models**: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

| | | |
|---|---|---|
| **Unit-II** | **Software Project Management** | **10Hrs** |

**Software Project Management:** Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

**Requirements Analysis and Specification**: Requirements gathering and analysis, Functional and Non-functional Requirements, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

| | | |
|---|---|---|
| **Unit-III** | **Software Design** | **10Hrs** |

**Software Design**: Overview of the design process, How to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design.

**Agility**: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2)

**Function-Oriented Software** Design: Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.

**User Interface Design**: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

| Unit-IV | Coding And Testing | 10Hrs |
|---|---|---|
| **Coding And Testing**: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, Testing object-oriented programs, Smoke testing, and Some general issues associated with testing.<br>**Software Reliability and Quality Management**: Software reliability. Statistical testing, Software quality, Software quality management system, ISO 9000. SEI Capability maturity model. Few other important quality standards, and Six Sigma. Software Metrics | | |
| **Unit-V** | **Computer-Aided Software Engineering (Case)** | **9Hrs** |
| **Computer-Aided Software Engineering (Case):** CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.<br>Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.<br>Software Reuse: reuse- definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level. | | |

**Text Books:**

1. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
2. Software Engineering A Practitioner's Approach, Roger S. Pressman, 9th Edition, Mc-Graw Hill International Edition.

**Reference Books:**

1. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
2. Software Engineering A practitioner's Approach, Roger S. Pressman, 9th Edition, Mc-Graw Hill International Edition.

**Web References:**

1. https://nptel.ac.in/courses/106/105/106105182/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview

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**B.Tech II Year II Semester**

**OPERATING SYSTEMS LAB**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0514P | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

This course will enable students to:
- Provide insights into system calls, file systems, semaphores,
- Develop and debug CPU Scheduling algorithms, page replacement algorithms, thread implementation
- Implement Bankers Algorithms to Avoid the Dead Lock

**Course Outcomes(CO):**

**On completion of this course, student will be able to**
- Trace different CPU Scheduling algorithms (L2).
- Implement Bankers Algorithms to Avoid the Dead Lock (L3).
- Evaluate Page replacement algorithms (L5).
- Illustrate the file organization techniques (L4).
- Illustrate Inter process Communication and concurrent execution of threads (L4)

| **Experiments:** | **Total Hours:48** |
|---|---|

Week-1:
1. Practicing of Basic UNIX Commands.

Week-2:
2. Write programs using the following UNIX operating system callsfork, exec, getpid, exit, wait, close, stat, opendir and readdir

Week-3:
3. Simulate UNIX commands like cp, ls, grep, etc.,

Week-4:
4. Simulate the following CPU scheduling algorithms
 a) FCFS b) SJF c) Priority d) Round Robin

Week-5:
5. Control the number of ports opened by the operating system with
 a)Semaphore b) Monitors.

Week-6:
6. Write a program to illustrate concurrent execution of threads using pthreads library.

Week-7:
7. Write a program to solve producer-consumer problem using Semaphores.

Week-8:
8. Implement the following memory allocation methods for fixed partition
 a) First fit b) Worst fit c) Best fit

Week-9:
9. Simulate the following page replacement algorithms
 a)FIFO b) LRU c) LFU

Week-10:
10. Simulate Paging Technique of memory management.

Week-11:
11. Implement Bankers Algorithm for Dead Lock avoidance and prevention

Week-12:

12. Simulate the following file allocation strategies
    a)Sequential b) Indexed c) Linked

**Experiments covering the Topics:**

- UNIX fundamentals, commands & system calls
- CPU Scheduling algorithms, thread processing
- IPC, semaphores, monitors, deadlocks
- Page replacement algorithms, file allocation strategies
- Memory allocation strategies

**Reference Books:**

1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley,2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson, 2016
3. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson,2018
4. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition,McGraw- Hill, 2013

**Web References:**

1. https://www.cse.iitb.ac.in/~mythili/os/
2. http://peterindia.net/OperatingSystems.html
3. https://nptel.ac.in/courses/106/106/106106144/

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**B.Tech II Year II Semester**

| DATABASE MANAGEMENT SYSTEMS LAB (Common to CSE, AI&ML, DS, CS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0515P** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **PC** |

**Course Objectives:**

This course will enable students to:

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers.

**Course Outcomes(CO):**

**On completion of this course, student will be able to**

- Utilizing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment (L3)
- Constructing and execute queries to manipulate and retrieve data from databases. (L3)
- Develop application programs using PL/SQL. (L3)
- Analyze requirements and design custom Procedures, Functions, Cursors, and Triggers, leveraging their capabilities to automate tasks and optimize database functionality (L4)
- Establish database connectivity through JDBC (Java Database Connectivity) (L3)

| **Experiments:** | **Total Hours:48** |
|---|---|

**Week-1:**

1. Creation, altering and droping of tables and inserting rows into a table (use constraintswhile creating tables) examples using SELECT command.

**Week-2:**

2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.

**Week-3:**

3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

**Week-4:**

4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)

**Week-5**

5. i Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can beselected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

**Week-6:**

6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.

**Week-7:**

7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.

**Week-8:**

8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

**Week-9:**

9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

**Week-10:**

10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

**Week-11:**

11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

**Week-12:**

12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

**Week-13:**

13. Write a Java program that connects to a database using JDBC

**Week-14:**

14. Write a Java program to connect to a database using JDBC and insert values into it

**Week-15:**

15. Write a Java program to connect to a database using JDBC and delete values from it

**Experiments covering the topics:**

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

**Text Books:**


1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, “Introduction to SQL”, Fourth Edition, Pearson Education, 2007

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**B.Tech II Year II Semester**

**FULL STACK DEVELOPMENT – 1**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0516P | 0:1:2:2 | 2 | CIE: 30 SEE:70 | 3 Hours | SE |

**Course Objectives:**

This course will enable students to:

- Make use of HTML elements and their attributes for designing static web pages
- Build a web page by applying appropriate CSS styles to HTML elements
- Experiment with JavaScript to develop dynamic web pages and validate forms

**Course Outcomes(CO):**

**On completion of this course, student will be able to**

- CO1: Design Websites. (L6)
- CO2: Apply Styling to web pages. (L4)
- CO3: Make Web pages interactive. (L6)
- CO4: Design Forms for applications. (L6)
- CO5: Choose Control Structure based on the logic to be implemented. (L3)
- CO6: Understand HTML tags, Attributes and CSS properties (L2)

| Experiments: | Total Hours:48 |
|---|---|

**1. Lists, Links and Images**

a. Write a HTML program, to explain the working of lists.
**Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.**

b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.

c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.

d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

**2. HTML Tables, Forms and Frames**

- Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, **<td> and attributes: border, rowspan, colspan)**
- Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).
  Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).
- Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame image, second frame paragraph, third frame □ hyperlink. And also make sure of using "no frame" attribute such that frames tobe fixed).

**3. HTML 5 and Cascading Style Sheets, Types of CSS**

a. Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, **<footer>, <header>, <main>, <nav>, <section>, <div>, <span> tags.**
b. Write a HTML program, to embed audio and video into HTML web page.
c. Write a program to apply different types (or levels of styles or style specification formats) **- inline, internal, external styles to HTML elements. (identify selector, property and value).**

**4. Selector forms**

a. Write a program to apply different types of selector forms
    - Simple selector (element, id, class, group, universal)
    - Combinator selector (descendant, child, adjacent sibling, general sibling)
    - Pseudo-class selector
    - Pseudo-element selector
    - Attribute selector

**5. CSS with Color, Background, Font, Text and CSS Box Model**

a. Write a program to demonstrate the various ways you can reference a color in CSS.
b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
c. Write a program using the following terms related to CSS font and text:
    **i.** font-size ii. font-weight iii. font-style
    iv. text-decoration v. text-transformation vi. text-alignment
d. Write a program, to explain the importance of CSS Box model using
    **i.** Content ii. Border iii. Margin iv. padding

**6. Applying JavaScript - internal and external, I/O, Type Conversion**

a. Write a program to embed internal and external JavaScript in a web page.
b. Write a program to explain the different ways for displaying output.
c. Write a program to explain the different ways for taking input.
d. Create a webpage which uses prompt dialogue box to ask a voter for his name and age.Display the information in table format along with either the voter can vote or not

**7. JavaScript Pre-defined and User-defined Objects**

a. Write a program using document object properties and methods.
b. Write a program using window object properties and methods.
c. Write a program using array object properties and methods.
d. Write a program using math object properties and methods.

e. Write a program using string object properties and methods.
f. Write a program using regex object properties and methods.
g. Write a program using date object properties and methods.
    Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

**8. JavaScript Conditional Statements and Loops**

a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words “LARGER NUMBER” in an information message dialog. If the numbers are equal, output HTML text as “EQUAL NUMBERS”.
b. Write a program to display week days using switch case.
c. Write a program to print 1 to 10 numbers using for, while and do-while loops.

d. Write aprogram to print data in object using for-in, for-each and for-of loops
e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits isequal to the number i.e.,13 + 53+ 33 = 153]
f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1-1's)

**9. Javascript Functions and Events**

a. Design a appropriate function should be called to display
   - Factorial of that number
   - Fibonacci series up to that number
   - Prime numbers up to that number
   - Is it palindrome or not

b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime,and Palindrome. When a button is pressed an appropriate function should be called to display
   11. Factorial of that number
   12. Fibonacci series up to that number
   13. Prime numbers up to that number
   14. Is it palindrome or not

c. Write a program to validate the following fields in a registration page
   i. Name (start with alphabet and followed by alphanumeric and the length should notbe less than 6 characters)
   ii. Mobile (only numbers and length 10 digits)
   iii. E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

**Experiments covering the Topics:**

- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML 5 and Cascading Style Sheets, Types of CSS
- Selector forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript - internal and external, I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events
- Node.js

**Text Books:**

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

**Web References:**

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs
5. https://www.w3schools.com/typescript

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**B.Tech II Year II Semester**

| **DESIGN THINKING FOR INNOVATION**<br>(Common to CSE, AI&ML, DS, CS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L: T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0413T** | **2:0:0:0** | **2** | **CIE: 30 SEE:70** | **3 Hours** | **HS** |

**Course Objectives:**

This course will enable students to:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Define the concepts related to design thinking. (L1, L2)
- Explain the fundamentals of Design Thinking and innovation (L1, L2)
- Apply the design thinking techniques for solving problems in various sectors. (L3)
- Analyse to work in a multidisciplinary environment (L4)
- Evaluate the value of creativity (L5)
- Formulate specific problem statements of real time issues (L3, L6)

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Introduction to Design Thinking** | **9Hrs** |

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

| **Unit-II** | **Design Thinking Process** | **10Hrs** |
|---|---|---|

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

**Activity**: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

| **Unit-III** | **Innovation** | **10Hrs** |
|---|---|---|

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

| **Unit-IV** | **Product Design** | **10Hrs** |
|---|---|---|

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

**Activity**: Importance of modelling, how to set specifications, Explaining their own product design.

| Unit-V | Design Thinking in Business Processes | 9Hrs |
|---|---|---|
| Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups-Defining and testing Business Models and Business Cases-Developing & testing prototypes. Activity: How to market our own product, About maintenance, Reliability and plan forstartup. | | |

**Text Books:**

1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

**Reference Books:**

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell,Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough.H, The Era of Open Innovation – 2013

**Web References:**

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview

**Tech II Year II Semester**

## COMMUNITY SERVICE PROJECT

(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0528 | 2:0:0:0 | 2 | CIE: 30 SEE:70 | 3 Hours | PR |

### Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as asocially responsible institution.

### Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

### Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and gradecould be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.

- Minor project reports should be submitted by each student. An internal Viva shall alsobe conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

**Procedure**

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
  - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
  - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
    - Agriculture
    - Health
    - Marketing and Cooperation
    - Animal Husbandry
    - Horticulture
    - Fisheries
    - Sericulture
    - Revenue and Survey
    - Natural Disaster Management
    - Irrigation
    - Law & Order
    - Excise and Prohibition
    - Mines and Geology
    - Energy
    - Internet
    - Free Electricity
    - Drinking Water

**EXPECTED OUTCOMES**
**BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS**

**Learning Outcomes**

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

**Personal Outcomes**

Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

**Social Outcomes**

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

**Career Development**

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.

**Relationship with the Institution**

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

**BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS**

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines orinstitutions
- A stronger commitment to one's research.

**BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES**

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

**BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY**

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

**SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT**

**The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.**

**For Engineering Students**

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods

15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling lvel- observation.

**Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs**

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant themes.

Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness

9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations

Personality Development

Common Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law & Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

**Role of Students:**

- Students may not have the expertise to conduct all the programmes on their own. Thestudents then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

**Timeline for the Community Service Project Activity** **Duration: 8 weeks**

**1. Preliminary Survey (One Week)**

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. **Community Awareness Campaigns (One Week)**
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.
3. **Community Immersion Programme (Three Weeks)**
   - Along with the Community Awareness Programmes**,** the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.
4. **Community Exit Report (One Week)**
   - During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

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| III Year I Semester (Theory-5, Lab-2, SE-1, MC-1, PR-1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | PC | 23A3301T | Artificial Intelligence | 3 | 0 | 0 | 3 |
| 2 | PC | 23A0520T | Computer Networks & Internet Protocols | 3 | 0 | 0 | 3 |
| 3 | PC | 23A0521T | Automata Theory and Compiler Design | 3 | 0 | 0 | 3 |
| 4 | PC | 23A0522T | Introduction to Quantum Technologies and Applications | 3 | 0 | 0 | 3 |
| 5 | PE | 23A0524Ta<br>23A0524Tb<br>23A0416T<br>23A0524Tc | **Professional Elective-I**<br>Object Oriented Analysis and Design<br>Soft Computing<br>Introduction to Microprocessors & Microcontrollers<br>Data Warehousing & Data Mining | 3 | 0 | 0 | 3 |
| 6 | OE | | Open Elective-I | 3 | 0 | 0 | 3 |
| 7 | PC | 23A0525P | Artificial Intelligence Lab | 0 | 0 | 3 | 1.5 |
| 8 | PC | 23A0526P | Computer Networks & Internet Protocols Lab | 0 | 0 | 3 | 1.5 |
| 9 | SE | 23A0527P | **Skill Enhancement Course**<br>Full Stack Development – II | 0 | 1 | 2 | 2 |
| 10 | MC | 23A0420P | Tinkering Lab | 0 | 0 | 2 | 1 |
| 11 | PR | 23A0528 | Evaluation of Community Service Project | - | - | - | 2 |
| **Total** | | | | **18** | **1** | **10** | **26** |

| **Category** | **Credits** |
|---|---|
| Professional Core Courses(PC) | 15 |
| Professional Elective Courses(PE) | 3 |
| Open Elective Courses(OE) | 3 |
| Skill Enhancement Course(SE) | 2 |
| Mandatory Course(MC) | 1 |
| Community Service Project (PR) | 2 |
| Total | 26 |

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## Open Elective – I

| Sl. No. | Course Code | Course Title | Offered by the Dept |
|---|---|---|---|
| 1 | 23A0148T | Green Buildings | CIVIL |
| 2 | 23A0149T | Construction Technology and Management | CIVIL |
| 3 | 23A0222T | Electrical Safety Practices and Standards | EEE |
| 4 | 23A0319T | Sustainable Energy Technologies | ME |
| 5 | 23A0442T | Electronic Circuits | ECE |
| 6 | 23A0547T | Quantum Technologies And Applications | CSE & Allied |
| 7 | 23A0027T | Mathematics for Machine Learning and AI | Mathematics |
| 8 | 23A0034T | Materials Characterization Techniques | Physics |
| 9 | 23A0040T | Chemistry of Energy Systems | Chemistry |
| 10 | 23A0044T | English for Competitive Examinations | Humanities |
| 11 | 23A0051T | Entrepreneurship and New Venture Creation | Humanities |

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**B.Tech III Year I Semester**

**ARTIFICIAL INTELLIGENCE**
(Common to CSE and AIML)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A3301T | 3: 0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

This course will enable students:

- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.
- To learn different knowledge representation techniques

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Apply searching techniques for solving a problem
- Design Intelligent Agents
- Develop Natural Language Interface for Machines
- Design mini robots
- Summarize past, present and future of Artificial Intelligence

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction** | **10Hrs** |

Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

| | | |
|---|---|---|
| **Unit-II** | **Searching** | **9Hrs** |

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

| | | |
|---|---|---|
| **Unit-III** | **Representation of Knowledge** | **10Hrs** |

Representation of Knowledge: Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and dempstershafer theory.

| | | |
|---|---|---|
| **Unit-IV** | **Logic concepts** | **9Hrs** |

Logic concepts: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

| Unit-V | Expert Systems | 10Hrs |
|---|---|---|
| Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells. | | |

**Text Books:**

1. S. Russel and P. Norvig, ―Artificial Intelligence – A Modern Approach‖, Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., ―Artificial Intelligence (SIE)‖, McGraw Hill

**Reference Books:**

1. David Poole, Alan Mack worth, Randy Goebel,‖ Computational Intelligence: a logical approach‖, Oxford University Press.
2. G. Luger, ―Artificial Intelligence: Structures and Strategies for complex problem solving, Fourth Edition, Pearson Education.
3. J. Nilsson, ―Artificial Intelligence: A new Synthesis‖, Elsevier Publishers.
4. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning.

**Web References:**

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

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**B.Tech III Year I Semester**

**COMPUTER NETWORKS & INTERNET PROTOCOLS**
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0520T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

This course will enable students to:

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Identify the software and hardware components of a computer network
- Design software for a computer network
- Develop new routing, and congestion control algorithms
- Assess critically the existing routing protocols
- Explain the functionality of each layer of a computer network
- Choose the appropriate transport protocol based on the application requirements

| | Syllabus | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Computer Networks and the Internet** | **9Hrs** |

What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks(Textbook 2), Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission (Textbook 1)

| | | |
|---|---|---|
| **Unit-II** | **The Data Link Layer, Access Networks, and LANs** | **10Hrs** |

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1)

Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2)

| | | |
|---|---|---|
| **Unit-III** | **The Network Layer** | **10Hrs** |

Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1).

| | | |
|---|---|---|
| **Unit-IV** | **The Transport Layer** | **9Hrs** |

Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1).

| | | |
|---|---|---|
| **Unit-V** | **Principles of Network Applications** | **10Hrs** |

Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet‘s Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks (Textbook 2).

**Text Books:**

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 6th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, ―Computer Networking: A Top-Down Approach‖, 6th edition, Pearson, 2019.

**Reference Books:**

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akthar, ―Networks for Computer Scientists and Engineers‖, Oxford Publishers, 2016.

**Web References:**

1. https://nptel.ac.in/courses/106105183/25
2. http://www.nptelvideos.in/2012/11/computer-networks.html
3. https://nptel.ac.in/courses/106105183/3

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## B.Tech III Year I Semester

| AUTOMATA THEORY AND COMPILER DESIGN (Common to CSE and CS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0521T** | **3: 0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **PC** |

**Course Objectives**

This course will enable students:

- Able to understand the concept of abstract machines, construct FA, Regular Expressions for the regular languages and equivalent FSMs.
- Able to construct pushdown automata equivalent to Context free Grammars, construct Turing Machines and understand undecidability.
- Emphasize the concepts learnt in phases of compiler, lexical analyser and Top-down parser.
- Able to understand the concepts of Bottom-up parser, Intermediate Code Generation.
- Able to understand the concepts of Code optimizer and Code Generation.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Demonstrate knowledge on Automata Theory, Regular Expression and Analyze and Design of finite automata, and prove equivalence of various finite automata.
- Demonstrate knowledge on context free grammar, Analyze and design of PDA and TM.
- Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.
- Ability to implement semantic rules into a parser that performs attribution while parsing and apply error detection and correction methods.
- Apply the code optimization techniques to improve the space and time complexity of programs while programming and Ability to design a compiler.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction to Automata and Regular Expressions** | **10Hrs** |

Introduction, Alphabets, Strings and Languages, Chomsky Hierarchy, Automata and Grammars, Regular Grammar and Language, Finite Automata, Deterministic finite Automata (DFA), Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Regular Expressions, Converting Regular Grammar and Expression into Finite Automata, Pumping lemma for regular sets, Closure properties of regular sets (Without proof).

| | | |
|---|---|---|
| **Unit-II** | **Context Free Grammars and Pushdown Automata** | **9Hrs** |

Context Free Language, Context Free Grammar, Derivation and Parse tree, Ambiguity, Simplification of CFG's, Chomsky Normal Form, Greibach Normal Form, Push Down Automat (PDA), Design of PDA, Equivalence of PDA and CFL/CFG

| | | |
|---|---|---|
| **Unit-III** | **Turing Machines and Introduction to Compilers** | **10Hrs** |

Turing Machine, TM Model, Language acceptance, Design of Turing Machine, Compilers, Phases of Compiler, The role of Lexical Analyzer, Input Buffering.

| Unit-IV | Parsers and Intermediate Code Generation | 9Hrs |
|---|---|---|
| Parser, Top-Down parsers: Recursive Descent Parsers, Predictive Parsers Bottom–up Parsers: Shift-Reduce Parsing, LR parsers, Intermediate Code Generation: Three address codes. | | |
| **Unit-V** | **Code Optimization and Code Generation** | **10Hrs** |
| Code Optimization: Peephole optimization, Basic blocks and flow graphs, DAG, Principles of Source Code Optimization, Code Generation: Issues in Design of Code Generation, Simple Code Generator. | | |

**Text Books:**

1. Introduction to Automata theory languages and Computation, Hopcroft H.E. and Ullman Jeffrey.D, 3/e, 2006, Pearson Education, New Delhi, India.
2. Mishra K L P and Chandrasekaran N, ―Theory of Computer Science - Automata, Languages and Computation‖, 2/e, 2007, PHI, New Delhi, India.
3. Compilers: Principles, Techniques, and Tools, Updated 2e July 2023 Alfred V. Aho , Monica S. Lam, Ravi Sethi , Jeffrey D. Ullman , Sorav Bansal

**Reference Books:**

1. Introduction to Languages and Theory of Computation, John C Martin, 1/e, 2009, Tata McGraw Hill Education, Hyderabad, India.
2. Introduction to Theory of Computation, Sipser, 2/e, 2005, Thomson, Australia.
3. Compiler Construction: Principles And Practice, Kenneth C. Louden, Thomson/ Delmar Cengage Learning, 2006.
4. Lex &yacc, Doug Brown, John Levine and Tony Mason, 2 nd Edition, O‘reilly Media
5. Engineering a compiler, Keith Cooper and Linda Torczon, 2 nd Edition, Morgan Kaufmann, 2011.

**Web references:**

1. https://onlinecourses.nptel.ac.in/noc21_cs83/preview
2. https://nptel.ac.in/courses/106104028
3. https://onlinecourses.nptel.ac.in/noc21_cs07/preview
4. https://nptel.ac.in/courses/106105190

**B.Tech III Year I Semester**

**INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS**
(Common to All branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0522T | 3: 0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

- Introduce fundamental quantum concepts like superposition and entanglement.
- Understand theoretical structure of qubits and quantum information.
- Explore conceptual challenges in building quantum computers.
- Explain principles of quantum communication and computing.
- Examine real-world applications and the future of quantum technologies.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Explain core quantum principles in a non-mathematical manner.
- Compare classical and quantum information systems.
- Identify theoretical issues in building quantum computers.
- Discuss quantum communication and computing concepts.
- Recognize applications, industry trends, and career paths in quantum technology

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction to Quantum Theory and Technologies** | **10Hrs** |

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India‘s Quantum Mission, EU, USA, China

| | | |
|---|---|---|
| **Unit-II** | **Theoretical Structure of Quantum Information Systems** | **9Hrs** |

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role

| | | |
|---|---|---|
| **Unit-III** | **Building a Quantum Computer – Theoretical Challenges and Requirements** | **10Hrs** |

What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Visionvs reality: what‘s working and what remains elusive, The role of quantum software in managing theoretical complexities

| **Unit-IV** | **Quantum Communication and Computing – Theoretical Perspective** | **9Hrs** |
|---|---|---|

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential

| **Unit-V** | **Applications, Use Cases, and the Quantum Future** | **10Hrs** |
|---|---|---|

Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race

**Text Books:**

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

**Reference Books:**

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.
4. Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.
5. Eleanor G. Rieffel, Wolfgang H. Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
6. Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.
7. Bruce Rosenblum, Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.
8. GiulianoBenenti, GiulioCasati, GiulianoStrini, Principles of Quantum Computation and Information, Volume I: Basic Concepts, World Scientific Publishing, 2004.
9. K.B. Whaley et al., Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document, Quantum Flagship, European Commission, 2020.
10. Department of Science & Technology (DST), Government of India, National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers, MeitY/DST Publications, 2020 onward.

**Web References:**

- IBM Quantum Experience and Qiskit Tutorials
- Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
- edX – The Quantum Internet and Quantum Computers
- YouTube – Quantum Computing for the Determined by Michael Nielsen
- Qiskit Textbook – IBM Quantum

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## B.Tech III Year I Semester

| OBJECT ORIENTED ANALYSIS AND DESIGN (Common to CSE and DS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0524Ta** | **3: 0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **PE** |

**Course Objectives:**

- Describe the activities in the different phases of the object-oriented development life cycle.
- Understand the concepts of object-oriented model with the E-R and EER models.
- Model a real-world application by using UML diagram.
- Design architectural modelling.
- Describing an application of UML.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- The importance of modelling in UML.
- Compare and contrast the object-oriented model with the E-R and EER models.
- Design use case diagram. Design an application using deployment diagram.
- Apply UML diagrams to build library application.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **UNIT – I** | **10Hrs** |

Introduction to UML: Importance of modelling, principles of modelling, object-oriented modelling, conceptual model of the UML, Architecture, Software Development Life Cycle.

| | | |
|---|---|---|
| **Unit-II** | **UNIT – II** | **9Hrs** |

Basic Structural Modelling: Classes, Relationships, common Mechanisms, and diagrams.

Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Class & Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams.

| | | |
|---|---|---|
| **Unit-III** | **UNIT – III** | **10Hrs** |

Basic Behavioural Modelling-I: Interactions, Interaction diagrams.

Basic Behavioural Modelling-II: Use cases, Use case Diagrams, Activity Diagrams.

| | | |
|---|---|---|
| **Unit-IV** | **UNIT – IV** | **9Hrs** |

Advanced Behavioral Modelling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modelling: Component, Deployment, Component diagrams and Deployment diagrams.

| | | |
|---|---|---|
| **Unit-V** | **UNIT – V** | **10Hrs** |

Patterns and Frameworks, Artifact Diagrams. Case Study: The Unified Library application.

**Text Books:**

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modelling Language User Guide, Pearson Education 2nd Edition.
2. Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.

**Reference Books:**

1. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modelling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML, TMH.
5. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education

**Web References:**

1. https://onlinecourses.nptel.ac.in/noc19_cs48/preview

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**B.Tech III Year I Semester**

**SOFT COMPUTING**
(Common to CSE and DS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0524Tb | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PE |

**Course Objectives:**

This course will enable students to:

- Familiarize with soft computing concepts
- Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
- Familiarize the Neuro-Fuzzy modelling using Classification and Clustering techniques
- Learn the concepts of Genetic algorithm and its applications
- Acquire the knowledge of Rough Sets.

**Course Outcomes (CO):**

After completion of the course, students will be able to:

- Identify the difference between Conventional Artificial Intelligence to Computational Intelligence.
- Understand fuzzy logic and reasoning to handle and solve engineering problems
- Apply the Classification techniques on various applications.
- Perform various operations of genetic algorithms and Rough Sets.

| | Syllabus | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction to Soft Computing** | **10Hrs** |

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.

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| **Unit-II** | **Fuzzy Systems** | **9Hrs** |

Fuzzy Systems: Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems

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| **Unit-III** | **Fuzzy Decision Making** | **9Hrs** |

Fuzzy Decision Making, Particle Swarm Optimization.

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|---|---|---|
| **Unit-IV** | **Genetic Algorithms** | **10Hrs** |

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

| | | |
|---|---|---|
| **Unit-V** | **Rough Sets** | **10Hrs** |

Rough Sets, Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

**Textbooks:**

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha – Cengage Learning

**Reference Books:**

1. S. N. Sivanandam & S. N. Deepa, ―Principles of Soft Computing‖, 2nd edition, Wiley India, 2008.
2. David E. Goldberg, ―Genetic Algorithms-In Search, optimization and Machine learning‖, Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, ―Neuro-Fuzzy and Soft Computing‖, Pearson Education, 2004.
4. G.J. Klir & B. Yuan, ―Fuzzy Sets & Fuzzy Logic‖, PHI, 1995. 5. Melanie Mitchell, ―An Introduction to Genetic Algorithm‖, PHI, 1998. 6. Timothy J. Ross, ―Fuzzy Logic with Engineering Applications‖, McGraw- Hill International editions, 1995.

**Web References:**

1. https://onlinecourses.swayam2.ac.in/ntr25_ed63/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs54/preview

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**B.Tech III Year I Semester**

**INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS**
**(Common to CSE,CS and DS)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0416T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PE |

**Course Objectives:**

1. To comprehend the architecture, operation, and configurations of the 8086 microprocessors.
2. To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. To learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

**Course Outcomes (CO):**

After completion of the course, students will be able to:

1. Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.
2. Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. Know the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. Learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | | **10Hrs** |

**8086 Architecture**: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration

| **Unit-II** | | **10Hrs** |
|---|---|---|

**8086 Programming**: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

| **Unit-III** | | **10Hrs** |
|---|---|---|

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

| **Unit-IV** | | **9Hrs** |
|---|---|---|

**Microcontroller :** Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming

| **Unit-V** | | **9Hrs** |
|---|---|---|

**Interfacing Microcontroller :-** Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors.

**Textbooks:**


1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.


**Reference Books:**


1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.


**Web References:**

1.

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## B.Tech III Year I Semester

| DATA WAREHOUSING &DATA MINING (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0524Tc** | **3: 0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **PE** |

**Course Objectives:**

This course will enable students:
- Familiarize with mathematical foundations of data mining tools.
- Introduce classical models and algorithms in data warehouses and data mining.
- Investigate the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- Explore data mining techniques in various applications like social, scientific and environmental context.

**Course Outcomes (CO):**

Upon completion of the course, the students should be able to:
- Design a Data warehouse system and perform business analysis with OLAP tools
- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis
- Design appropriate classification and clustering techniques for data analysis
- Infer knowledge from raw data

| Syllabus | | Total Hours:43 |
|---|---|---|
| **Unit-I** | **Basic Concepts of Data Warehousing** | **9Hrs** |
| Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.. | | |
| **Unit-II** | **Introduction to Data Mining Systems** | **9Hrs** |
| Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures. | | |
| **Unit-III** | **Mining patterns and methods** | **8Hrs** |
| Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns. | | |
| **Unit-IV** | **Classification Algorithms** | **9Hrs** |
| Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis-Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods. | | |

| Unit-V | WEKA TOOL | 8Hrs |
|---|---|---|
| Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database – Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners | | |

**Text Books:**

1. Jiawei Han and Micheline Kamber, ―Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.

**Reference Books:**

1. Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, Shyam Diwakar and V. Ajay, ―Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H.Witten and Eibe Frank, ―Data mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

**Web References:**

1. **https://onlinecourses.swayam2.ac.in/imb25_mg200/preview**
2. **https://onlinecourses.swayam2.ac.in/cec19_cs01/preview**

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**B.Tech III Year I Semester**

**GREEN BUILDINGS**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0148T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

**This course will enable students to:**

- To understand the fundamental concepts of green buildings, their necessity, and Sustainable features.
- To analyze green building concepts, rating systems, and their benefits in India.
- To apply green building design principles, energy efficiency measures, and Renewable energy sources.
- To evaluate air conditioning systems, HVAC designs, and energy modeling for Sustainable buildings.
- To assess material conservation strategies, waste management, and indoor environmental quality in green buildings.

**Course Outcomes(CO):**

**On completion of this course, student will be able to**

- Understand the importance of green buildings, their necessity, and sustainable features.
- Analyze various green building practices, rating systems, and their impact on environmental sustainability.
- Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources.
- Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.
- Assess material conservation techniques, waste reduction strategies, and indoor air quality management in green buildings.

| | Syllabus | Total Hours:48 |
|---|---|---|
| **UNIT-I** | **Introduction** | **9Hrs** |

Introduction to Green Building– Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing A Green Building, Important Sustainable Features for Green Buildings.

| | | |
|---|---|---|
| **UNIT -II** | **Green Building Concepts and Practices** | **9Hrs** |

Green Building Concepts and Practices– Indian Green Building Council, Green Building Movement in India, Benefits Experiencedin Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving Approaches in Buildings, LEED India Rating System, and Energy Efficiency.

| | | |
|---|---|---|
| **UNIT -III** | **Green Building Design** | **10Hrs** |

Green Building Design– Introduction, Reductionin Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

| UNIT -IV | Air Conditioning | 10Hrs |
|---|---|---|
| Air Conditioning– Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements. | | |
| **UNIT -V** | **Material Conservation** | **10Hrs** |
| **Material Conservation**– Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health– Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke. | | |

**Text Books:**

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. Green Building Hand Book by tom woolley and Sam kimings, 2009.

**Reference Books:**

1. Complete Guide to Green Buildings by Trish riley
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009
3. Energy Conservation Building Code –ECBC-2020, published by BEE

**Web References:**

1. https://archive.nptel.ac.in/courses/105/102/105102195/

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**B.Tech III Year I Semester**

<table>
<tr><td colspan="6" align="center">CONSTRUCTION TECHNOLOGY AND MANAGEMENT<br>(Common to CSE, AI&ML, DS, CS)</td></tr>
<tr><td>Course Code</td><td>L:T:P:S</td><td>Credits</td><td>Exam Marks</td><td>Exam Duration</td><td>Course Type</td></tr>
<tr><td>23A0149T</td><td>3:0:0:0</td><td>3</td><td>CIE: 30 SEE:70</td><td>3 Hours</td><td>OE</td></tr>
<tr><td colspan="6">Course Objectives:</td></tr>
<tr><td colspan="6">This course will enable students to:<br>
• To understand project management fundamentals, organizational structures, and leadership principles in construction.<br>
• To analyze manpower planning, equipment management, and cost estimation in civil engineering projects.<br>
• To apply planning, scheduling, and project management techniques such as CPM and PERT.<br>
• To evaluate various contract types, contract formation, and legal aspects in construction management.<br>
• To assess safety management practices, accident prevention strategies, and quality management systems in construction.</td></tr>
<tr><td colspan="6">Course Outcomes(CO):</td></tr>
<tr><td colspan="6">On completion of this course, student will be able to<br>
• Understand (Cos)project management fundamentals, organizational structures, and leadership principles in construction.<br>
• Analyze manpower planning, equipment management, and cost estimation in civil engineering projects.<br>
• Apply planning, scheduling, and project management techniques such as CPM and PERT.<br>
• Evaluate various contract types, contract formation, and legal aspects in construction management.<br>
• Assess safety management practices, accident prevention strategies, and quality management systems in construction.</td></tr>
<tr><td colspan="4" align="center">Syllabus</td><td colspan="2">Total Hours:48</td></tr>
<tr><td>UNIT -I</td><td colspan="3">Introduction</td><td colspan="2">9Hrs</td></tr>
<tr><td colspan="6">Introduction: Project forms, Management Objectives and Functions; Organizational Chart of A Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability.</td></tr>
<tr><td>UNIT-II</td><td colspan="3">Man and Machine</td><td colspan="2">10Hrs</td></tr>
<tr><td colspan="6">Man and Machine: Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.</td></tr>
<tr><td>UNIT -III</td><td colspan="3">Planning, Scheduling and Project Management</td><td colspan="2">9Hrs</td></tr>
<tr><td colspan="6">Planning, Scheduling and Project Management: Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network- Formulation and Time Computation.</td></tr>
<tr><td>UNIT -IV</td><td colspan="3">Contracts</td><td colspan="2">10Hrs</td></tr>
<tr><td colspan="6">Contracts: Types of Contracts, formation of Contract – Contract Conditions – Contract For Labour, Material, Design, Construction – Drafting of Contract Documents Based On IBRD/ MORTH Standard Bidding Documents – Construction Contracts – Contract Problems – Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.</td></tr>
</table>

| UNIT -V | Safety Management | 10Hrs |
|---|---|---|
| Safety Management – Implementation and Application of QMS in Safety Programs, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics. | | |

**Text Books:**

1. Construction Project Management, SK. Sears, GA. Sears, RH. Clough, John Wiley and Sons, 6th Edition, 2016.
2. Construction Project Scheduling and Control by Saleh Mubarak, 4th Edition, 2019
3. Pandey, I.M (2021) Financial Management 12th edition. Pearson India Education Services Pvt. Ltd.

**Reference Books:**

1. Brien, J.O. and Plotnick, F.L., CPMin Construction Management, Mcgraw Hill, 2010.
2. Punmia, B.C., and Khandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2002.
3. Construction Methods and Management: Pearson New International Edition 8 th Edition Stephens Nunnally.
4. Rhoden, M and Cato B, Construction Management and Organisational Behaviour, Wiley Blackwell, 2016.

**Web References:**

1. NPTEL :: Civil Engineering - NOC:Principles of Construction Management
2. NPTEL :: Civil Engineering - Construction Planning and Management

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**B.Tech III Year I Semester**

**ELECTRICAL SAFETY PRACTICES AND STANDARDS**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0222T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

**This course will enable students to:**

- To impart knowledge of electrical hazards and safety standards applicable in industrial and domestic systems.
- To train students in safe work practices, risk assessment, and use of protective devices/PPE.
- To develop competence in accident prevention, emergency response, and compliance with electrical codes.

**Course Outcomes(CO):**

**On completion of this course, student will be able to**

- After completion of the course, students will be able to
- Understanding the Fundamentals of Electrical Safety.
- Identifying and Applying Safety Components.
- Analyzing Grounding Practices and Electrical Bonding
- Applying Safety Practices in Electrical Installations and Environments
- Evaluating Electrical Safety Standards and Regulatory Compliance

| Syllabus | | Total Hours:48 |
|---|---|---|
| **UNIT-I** | **Introduction To Electrical Safety** | **9Hrs** |

Fundamentals of Electrical safety-Electric Shock- physiological effects of electric current - Safety requirements –Hazards of electricity- Arc - Blast- Causes for electrical failure.

| | | |
|---|---|---|
| **UNIT -II** | **Safety Components** | **9Hrs** |

Introduction to conductors and insulators- voltage classification -safety against over voltages- safety against static electricity-Electrical safety equipment's - Fire extinguishers for electrical safety.

| | | |
|---|---|---|
| **UNIT -III** | **Grounding** | **10Hrs** |

General requirements for grounding and bonding- Definitions- System grounding-Equipment grounding - The Earth - Earthing practices- Determining safe approach distance-Determining arc hazard category.

| | | |
|---|---|---|
| **UNIT -IV** | **Safety Practices** | **10Hrs** |

General first aid- Safety in handling hand held electrical appliances tools- Electrical safety in train stations-swimming pools, external lighting installations, medical locations Case studies

| | | |
|---|---|---|
| **UNIT -V** | **Standards For Electrical Safety** | **10Hrs** |

Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards-IEEE standards-National Electrical Code 2005 – National Electric Safety code NESC-Statutory requirements from electrical inspectorate

**Text Books:**


1. Massimo A.G.Mitolo, ―Electrical Safety of Low-Voltage Systems‖, McGraw Hill, USA, 2009.
2. Mohamed El-Sharkawi, ―Electric Safety - Practice and Standards‖, CRC Press, USA, 2014


**Reference Books:**


1. Kenneth G.Mastrullo, Ray A. Jones, ―The Electrical Safety Program Book‖, Jones and Bartlett Publishers, London, 2nd Edition, 2011.
2. Palmer Hickman, ―Electrical Safety-Related Work Practices‖, Jones & Bartlett Publishers, London, 2009.
3. Fordham Cooper, W., ―Electrical Safety Engineering‖, Butterworth and Company, London, 1986.
4. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, ―Electrical Safety Hand book, McGraw-Hill, New York, USA, 4th edition, 2012.


**Web References:**

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## B.Tech III Year I Semester

**SUSTAINBLE ENERGY TECHNOLOGIES**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0319T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

**This course will enable students to:**

- To demonstrate the importance the impact of solar radiation, solar PV modules
- To understand the principles of storage in PV systems
- To discuss solar energy storage systems and their application ns.
- To get knowledge in wind energy and bio-mass
- To gain insights in geothermal energy, ocean energy and fuel cells.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Illustrate the importance of solar radiation and solar PV modules.
- Discuss the storage methods in PV systems
- Explain the solar energy storage for different applications
- Understand the principles of wind energy, and bio-mass energy.
- Attain knowledge in geothermal energy, ocean energy and fuel cells.

| Syllabus | | Total Hours:48 |
|---|---|---|
| UNIT-I | SOLAR RADIATION & SOLAR PV MODULES AND PV SYSTEMS | 9Hrs |

**SOLAR RADIATION**: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

**SOLAR PV MODULES AND PV SYSTEMS**: PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant. Installation and Maintenance.

| | | |
|---|---|---|
| UNIT -II | STORAGE IN PV SYSTEMS | 10Hrs |

**STORAGE IN PV SYSTEMS**: Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

| | | |
|---|---|---|
| UNIT -III | SOLAR ENERGY COLLECTION | 10Hrs |

**SOLAR ENERGY COLLECTION**: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

**SOLAR ENERGY STORAGE AND APPLICATIONS**: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

| UNIT -IV | WIND ENERGY & BIO-MASS | 10Hrs |
|---|---|---|

**WIND ENERGY**: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.
**BIO-MASS**: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

| UNIT -V | GEOTHERMAL ENERGY | 9Hrs |
|---|---|---|

**GEOTHERMAL ENERGY:** Origin, Applications, Types of Geothermal Resources, Relative Merits **OCEAN ENERGY:** Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges **FUEL CELLS:** Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

**Text Books:**

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH
2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006

**Reference Books:**

1. Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth& John F Kreider / Taylor &Francis
2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd
3. Renewable Energy Technologies -Ramesh & Kumar /Narosa
4. Non-conventional Energy Source- G.D Roy/Standard Publishers

**Web References:**

1. https://nptel.ac.in/courses/112106318
2. https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=-mwIa2X-SuSiNy13
3. https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=Apfjx6oDfz1Rb_N3 https://youtu.be/zx04Kl8y4dE?si=VmOvp_OgqisILTAF **III**

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**B.Tech III Year I Semester**

**ELECTRONIC CIRCUITS**
(Common to CSE,AI&ML,DS,CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0442T | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

This course will enable students to:

- To understand semiconductor diodes, their characteristics and applications.
- To explore the operation, configurations, and biasing of BJTs.
- To study the operation, analysis, and coupling techniques of BJT amplifiers.
- To learn the operation, applications and uses of feedback amplifiers and oscillators.
- To analyze the characteristics, configurations, and applications of operational amplifiers.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Understand semiconductor diodes, their characteristics and applications.
- Explore the operation, configurations, and biasing of BJTs.
- Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.
- Learn the operation, applications and uses of feedback amplifiers and oscillators.
- Analyze the characteristics, configurations, and applications of operational amplifiers.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **UNIT-I** | **Semiconductor Diode and Applications** | **9Hrs** |

Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).

**Special Diodes**: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode.

| | | |
|---|---|---|
| **UNIT -II** | **Bipolar Junction Transistor (BJT)** | **10Hrs** |

Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

| | | |
|---|---|---|
| **UNIT -III** | **Single and Multi stage amplifiers** | **10Hrs** |

**Single stage amplifiers:** Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

**Multistage amplifiers:** Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only).

| | | |
|---|---|---|
| **UNIT -IV** | **Feedback amplifiers** | **10Hrs** |

Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).

**Oscillators**: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator.

| UNIT -V | Op-amp | 9Hrs |
|---|---|---|

Classification of IC‘S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

**Applications of op-amp**: Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.

**Text Books:**

1. Electronics Devices and Circuits, J.Millman and Christos. C. Halkias, 3rd edition, Tata McGraw Hill, 2006.
2. Electronics Devices and Circuits Theory, David A. Bell, 5th Edition, Oxford University press. 2008..

**Reference Books:**

1. Electronics Devices and Circuits Theory, R.L.Boylestad, LousisNashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012
3. Microelectronic Circuits, S.Sedra and K.C.Smith, 5th Edition, Oxford University Press.

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**B.Tech III Year I Semester**

**QUANTUM TECHNOLOGIES AND APPLICATIONS**
(Common to all branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0547T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

This course will enable students to:

- To introduce the fundamentals of quantum mechanics relevant to quantum technologies.
- To explain key quantum phenomena and their role in enabling novel technologies.
- To explore applications in quantum computing, communication, and sensing.
- To encourage understanding of emerging quantum-based technologies and innovations.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Understand key quantum mechanical concepts and phenomena.
- Comprehend the structure and function of quantum algorithms and circuits.
- Explore applications in quantum communication and cryptography.
- Appreciate the role of quantum technologies in modern engineering systems.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | Fundamentals of Quantum Mechanics | **8Hrs** |

- Classical vs Quantum Paradigm
- Postulates of Quantum Mechanics
- Wavefunction and Schrödinger Equation (Time-independent)
- Quantum states, Superposition, Qubits
- Measurement, Operators, and Observables
- Entanglement and Non-locality

| | | |
|---|---|---|
| **Unit-II** | Quantum Computing | **10Hrs** |

- Qubits and Bloch Sphere
- Quantum Logic Gates: Pauli, Hadamard, CNOT, and Universal Gates
- Quantum Circuits
- Basic Algorithms: Deutsch-Jozsa. Gover‘s, Shor‘s (conceptual)
- Error Correction and Decoherence

| | | |
|---|---|---|
| **Unit-III** | Quantum Communication and Cryptography | **8Hrs** |

- Teleportation & No-Cloning and BB84 Protocol
- Quantum Networks & Repeaters
- Classical vs Quantum Cryptography
- Challenges in Implementation

| | | |
|---|---|---|
| **Unit-IV** | Quantum Sensors and Metrology | **9Hrs** |

- Quantum Sensing: Principles and Technologies
- Quantum-enhanced Measurements
- Atomic Clocks, Gravimeters
- Magnetometers, NV Centers
- Industrial Applications

| **Unit-V** | Quantum Materials and Emerging Technologies | **8Hrs** |
|---|---|---|
| • Quantum Materials: Superconductors, Topological Insulators<br>• Quantum Devices: Qubits, Josephson Junctions<br>• National Quantum Missions (India, EU, USA, China)<br>• Quantum Careers and Industry Initiatives | | |
| **Text Books:**<br>1. "Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang (Cambridge University Press)<br>2. "Quantum Mechanics: The Theoretical Minimum" by Leonard Susskind and Art Friedman (Basic Books) | | |
| **Reference Books:**<br>1. "Quantum Computing for Everyone" by Chris Bernhardt (MIT Press)<br>2. "Quantum Physics: A Beginner's Guide" by Alastair I.M. Rae<br>3. "An Introduction to Quantum Computing" by Phillip Kaye, Raymond Laflamme, and Michele Mosca<br>4. IBM Quantum Experience and Qiskit Documentation (https://qiskit.org/) | | |

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## B.Tech III Year I Semester

| | | | | | |
|---|---|---|---|---|---|
| **MATHEMATICS FOR MACHINE LEARNING AND AI** (Common to CSE, AI&ML, CS, DS) | | | | | |
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0027T** | **3:0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

This course will enable students:

- To provide a strong mathematical foundation for understanding and developing AI/ML
- To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.
- To equip students with optimization techniques and graph-based methods used in AI applications.
- To develop critical problem-solving skills for analyzing mathematical formulations in AI/ML.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Apply linear algebra concepts to ML techniques like PCA and regression.
- Analyze probabilistic models and statistical methods for AI applications.
- Implement optimization techniques for machine learning algorithms.
- Utilize vector calculus and transformations in AI-based models.
- Develop graph-based AI models using mathematical representations.

| | **Syllabus** | **Total Hours:48** |
|---|---|---|
| **UNIT-I** | **Linear Algebra for Machine Learning** | **9Hrs** |

Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigenvalues, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

| | | |
|---|---|---|
| **UNIT -II** | **Probability and Statistics for AI** | **10Hrs** |

Probability distributions: Gaussian, Binomial, Poisson. Bayes'Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP).Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.

| | | |
|---|---|---|
| **UNIT -III** | **Optimization Techniques for ML** | **10Hrs** |

Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient Descent and its variants (Momentum, Adam) Newton's method, BFGS method.

| | | |
|---|---|---|
| **UNIT -IV** | **Vector Calculus & Transformations** | **10Hrs** |

Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.

| | | |
|---|---|---|
| **UNIT -V** | **Graph Theory for AI** | **9Hrs** |

Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).

**Text Books:**

1. Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.
2. Pattern Recognition and Machine Learning by Christopher Bishop, Springer.

**Reference Books:**

1. Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.
2. Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.

**Web References:**

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## B.Tech III Year I Semester

| MATERIALS CHARACTERIZATION TECHNIQUES ( Common to CSE,AI&ML, DS,CS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0034T** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

**This course will enable students to:**

- To provide exposure to different characterization techniques.
- To explain the basic principles and analysis of different spectroscopic techniques.
- To elucidate the working of Scanning electron microscope - Principle, limitations and applications.
- To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications.
- To educate the uses of advanced electric and magnetic instruments for characterization.

**Course Outcomes(CO):**

**On completion of this course, student will be able to**

- Analyze the crystal structure and crystallite size by various methods
- Analyze the morphology of the sample by using a Scanning Electron Microscope Electron Microscope
- Analyze the morphology and crystal structure of the sample by using Transmission
- Explain the principle and experimental arrangement of various spectroscopic Techniques
- Identify the construction and working principle of various Electrical & Magnetic Characterization technique

| Syllabus | | Total Hours:48 |
|---|---|---|
| **UNIT-I** | **Structure analysis by Powder X-Ray Diffraction** | **10Hrs** |

Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

| | | |
|---|---|---|
| **UNIT -II** | **Microscopy technique -1 –Scanning Electron Microscopy (SEM)** | **9Hrs** |

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

| | | |
|---|---|---|
| **UNIT -III** | **Microscopy Technique -2 - Transmission Electron Microscopy (TEM)** | **9Hrs** |

Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy

| | | |
|---|---|---|
| **UNIT -IV** | **Spectroscopy techniques** | **10Hrs** |

Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

| UNIT -V | Electrical & Magnetic Characterization techniques | 10Hrs |
|---|---|---|
| Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID. | | |

**Text Books:**

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2013
2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008

**Reference Books:**

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville BanwellandElaine M. McCash, Tata McGraw-Hill, 2008
2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, Prentice Hall , 2001 – Science.
3. Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley – 2021.
4. Materials Characterization Techniques -Sam Zhang, Lin Li, Ashok Kumar -CRC Press - 2008

**Web References:**

1. NPTEL :: Civil Engineering - NOC:Principles of Construction Management
2. NPTEL :: Civil Engineering - Construction Planning and Management

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## B.Tech III Year I Semester

**CHEMISTRY OF ENERGY SYSTEMS**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0040T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

This course will enable students:

- To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of photo chemical cells, reactions and applications
- Necessity of harnessing alternate energy resources such as solar energy and its basic concepts.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquefaction method.

**Course Outcomes(CO):**

**On completion of this course, student will be able to:**

- Solve the problems based on electrode potential, Describe the Galvanic Cell
- Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer
- Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell
- Discuss about the Basic design of fuel cells, Classify the fuel cell
- Differentiate between Photo and Photo electrochemical Conversions, Illustrate the photochemical cells, Identify the applications of photochemical reactions,
- Interpret advantages of photoelectron catalytic conversion.
- Apply the photo voltaic technology, Demonstrate about solar energy and prospects
- Illustrate the Solar cells, Discuss about concentrated solar power
- Differentiate Chemical and Physical methods of hydrogen storage, Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures
- Describe the liquefaction methods.

| | Syllabus | Total Hours:48 |
|---|---|---|
| **UNIT-I** | **Electrochemical Systems** | **9Hrs** |

Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction ,Lead-acid ,Nickel- cadmium, Lithium ion batteries and their applications.

| | | |
|---|---|---|
| **UNIT -II** | **Fuel Cells** | **9Hrs** |

Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.

| | | |
|---|---|---|
| **UNIT -III** | **Photo and Photo electrochemical Conversions** | **10Hrs** |

Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions and their applications.

| UNIT -IV | Solar Energy | 10Hrs |
|---|---|---|
| Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications. | | |
| **UNIT -V** | **Hydrogen Storage** | **10Hrs** |
| Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel , and Organic hydrogen carriers. | | |

**Text Books:**

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins

**Reference Books:**

1. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services And corporation)
2. Hand book of solar energy and applications by ArvindTiwari and Shyam.
3. Solar energy fundamental, technology and systems by Klaus Jagar et.al. Hydrogen storage by Levine Klebonoff

**Web References:**

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**B.Tech III Year I Semester**

**ENGLISH FOR COMPETITIVE EXAMINATIONS**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0044T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

This course will enable students:

- To enable the students to learn about the structure of competitive English
- To understand the grammatical aspects and identify the errors
- To enhance verbal ability and identify the errors
- To improve word power to answer competitive challenges
- To make them ready to crack competitive exams

**Course Outcomes(CO):**

**On completion of this course, student will be able to:**

- Identify the basics of English grammar and its importance L1, L2
- Explain the use of grammatical structures in sentences L1, L2
- Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams L3
- Analyze an unknown passage and reach conclusions about it. L4
- Choose the appropriate form of verbs in framing sentences L5
- Develop speed reading and comprehending ability thereby perform better in competitive exams L3

| Syllabus | | Total Hours:48 |
|---|---|---|
| **UNIT-I** | **GRAMMAR-1** | **10Hrs** |
| Nouns-classification-errors-Pronouns-types-errors-Adjectives-types-errors-Articles-definite-indefinite-Degrees of Comparison-Adverbs-types- errors-Conjunctions-usage-Prepositions-usage-Tag Questions, types-identifying errors- Practice | | |
| **UNIT -II** | **GRAMMAR-2** | **9Hrs** |
| Verbs-tenses- structure-usages- negatives- positives- time adverbs-Sequence of tenses--If Clause-Voice-active voice and passive voice- reported Speech-Agreement- subject and verb-Modals-Spotting Errors-Practices | | |
| **UNIT -III** | **VERBAL ABILITY** | **9Hrs** |
| Sentence completion-Verbal analogies-Word groups-Instructions-Critical reasoning-Verbal deduction-Select appropriate pair-Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph. | | |
| **UNIT -IV** | **READING COMPREHENSION AND VOCUBULARY** | **10Hrs** |
| Competitive Vocabulary :Word Building – Memory techniques-Synonyms, Antonyms, Affixes-Prefix &Suffix-One word substitutes-Compound words-Phrasal Verbs-Idioms and Phrases-Homophones-Linking Words-Modifiers-Intensifiers - Mastering Competitive Vocabulary- Cracking the unknowing passage-speed reading techniques- Skimming & Scanning-types of answering–Elimination methods | | |

| UNIT -V | WRITING FOR COMPETITIVE EXAMINATIONS | 10Hrs |
|---|---|---|
| Punctuation- Spelling rules- Word order-Sub Skills of Writing- Paragraph meaning-salient features-types - Note-making, Note-taking, summarizing-precise writing- Paraphrasing-Expansion of proverbs- Essay writing-types | | |

**Text Books:**


1. Wren & Martin, English for Competitive Examinations, S.Chand & Co, 2021
2. Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.


**Reference Books:**


1. Hari Mohan Prasad, Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.
2. Philip Sunil Solomon, English for Success in Competitive Exams, Oxford 2016
3. Shalini Verma , Word Power Made Handy, S Chand Publications
4. Neira, Anjana Dev & Co. Creative Writing: A Beginner's Manual. Pearson Education India, 2008.
5. Abhishek Jain,Vocabulary Learning Techniques Vol.I&II,RR Global Publishers 2013.
6. Michel Swan, Practical English Usage,Oxford,2006.


**Web References:**


1. https://www.grammar.cl/english/parts-of-speech.htm
2. https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech
3. https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passive-voice
4. https://languagetool.org/insights/post/verb-tenses/
5. https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council
6. https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx

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## B.Tech III Year I Semester

| ENTREPRENEURSHIP AND NEW VENTURE CREATION (Common to CSE, AI&ML, DS, CS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0051T** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

This course will enable students to:

- To foster an entrepreneurial mind-set for venture creation and entrepreneurial leadership.
- To encourage creativity and innovation
- To enable them to learn pitching and presentation skills
- To make the students understand MVP development and validation techniques to Determine Product-Market fit and Initiate Solution design, Prototype for Proof of Concept.
- To enhance the ability of analyzing Customer and Market segmentation, estimate
- Market size, develop and validate Customer Persona.

**Course Outcomes(CO):**

**On completion of this course, student will be able to**

- Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship.
- Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution.
- Analyze and refine business models to ensure sustainability and profitability.
- Build Prototype for Proof of Concept and validate MVP of their practice venture idea.
- Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture.
- Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders.

| | **Syllabus** | **Total Hours:48** |
|---|---|---|
| **UNIT-I** | **Entrepreneurship Fundamentals and context** | **9Hrs** |

Meaning and concept, attributes and mindset of entrepreneurial and entrepreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus. Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students –16industries to choose from), Venture Activity.

| **UNIT -II** | **Problem & Customer Identification** | **9Hrs** |
|---|---|---|

Understanding and analysing the macro-Problem and Industry perspective technological, socioeconomic and urbanization trends and their implication on new opportunities - Identifying passion - identifying and defining problem using Design thinking principles - Analysing problem and validating with the potential customer - Understanding customer segmentation, creating and validating customer personas.

**Core Teaching Tool:** Several types of activities including Class, game, Gen AI, _Get out of the Building‘ and Venture Activity

| UNIT -III | Solution design, Prototyping & Opportunity Assessment and Sizing | 10Hrs |
|---|---|---|

Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer‘s needs and create a strong value proposition - Understanding prototyping and Minimum Viable product (MVP) - Developing a feasibility prototype with differentiating value, features and benefits - Assess relative market position via competition analysis - Sizing the market and assess scope and potential scale of the opportunity.

Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

| UNIT -IV | Business & Financial Model, Go-to-Market Plan | 10Hrs |
|---|---|---|

Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach. Business planning: components of Business plan- Sales plan, People plan and financial plan. Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance.Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt& Equity, Map the Start-up Life-cycle to Funding Options.

**Core Teaching Tool**: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities

| UNIT -V | Scale Outlook and Venture Pitch readiness | 10Hrs |
|---|---|---|

Understand and identify potential and aspiration for scale vis-a-vis your venture idea.Persuasive Storytelling and its key components. Build an Investor ready pitch deck.

**Core Teaching Tool**: Expert talks; Cases; Class activity and discussions; Venture Activities.

**Text Books:**

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha,Entrepreneurship, McGrawHill, 11th Edition.(2020)
2. Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous
3. Innovation to Create Radically Successful Businesses. Crown Business,(2011).
4. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for
5. Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).

**Reference Books:**

1. Simon Sinek,Start with Why, Penguin Books limited. (2011)
2. Brown Tim,Change by Design Revised & Updated: How Design Thinking
3. Transforms Organizations and Inspires Innovation, Harper Business.(2019)
4. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
5. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd.

**Web References:**

- Learning resource- Ignite 5.0 Course Wadhwani platform (Includes 200+ components of custom created modular content + 500+ components of the most relevant curated content)

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**B.Tech III Year I Semester**

## ARTIFICIAL INTELLIGENCE LAB
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0525P | 0:0:3:0 | 1.5 | CIE:30 SEE:70 | 3 Hours | PC |

The objectives of the course are to
- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems and machine learning.

**Course Outcomes (CO):**
- Understand the Mathematical and statistical prospectives of machine learning algorithms through python programming (L2)
- Appreciate the importance of visualization in the data analytics solution. (L5)
- Derive insights using Machine learning algorithms (L5)
- Implement and demonstrate AI and ML algorithms. (L5)
- Evaluate different algorithms. (L6)

**Syllabus**

**List of experiments**

1. Write a Program to Implement Breadth First Search using Python.
2. Write a program to implement Best First Searching Algorithm
3. Write a Program to Implement Depth First Search using Python.
4. Write a program to implement the Heuristic Search
5. Write a python program to implement A* and AO* algorithm. (Ex: find the shortest path)
6. Write a Program to Implement Water-Jug problem using Python.
7. Write a Program to Implement Alpha-Beta Pruning using Python.
8. Write a Program to implement 8-Queens Problem using Python.
9. Write a program to schedule a meeting among a 5 busy people using Default Reasoning the output should give the time, place and day of the meeting.
10. Write a program to implement the Unification algorithm
11. Develop a knowledge base system consisting of facts and rules about some specialized knowledge domain
12. Write a program to implement 8 puzzle programs using different heuristics. Using it play the game Tic-Tac-Toe at the end the game the program should display the no. of nodes generated, cutoff values at each stage in the form of a table.

**Text Books:**
1. PrateekJoshi,Artificial Intelligence with Python,Packt Publishing, 2017.
2. Xiao, Perry. Artificial intelligence programming with Python: from zero to hero. John Wiley & Sons, 2022.

**References:**
1. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Fourth Edition, Pearson, 2020
2. Martin C. Brown (Author), ―Python: The Complete Reference‖ McGraw Hill Education, Fourth edition, 2018
3. R. NageswaraRao , ―Core Python Programming‖ Dreamtech Press India Pvt Ltd 2018.

**Web Reference**


1. https://onlinecourses.nptel.ac.in/noc19_cs40/preview
2. https://onlinecourses.nptel.ac.in/noc19_cs41/preview

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**B.Tech III Year I Semester**

**COMPUTER NETWORKS & INTERNET PROTOCOLS LAB**
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0526P | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

This course will enable students to:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and
- observe its performance
- To analyze the traffic flow and the contents of protocol frames.
- Familiarize with the applications of Internet.

**Course Outcomes (CO):**

After completion of the course, students will be able to:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topologyand
- observe its performance.
- To analyze the traffic flow and the contents of protocol frames.
- Critique the existing routing protocols

**List of Experiments:**

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijkastra‘s algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting technique used in buffers.
10. Programs using Wireshark
    - ii. Packet Capture Using Wire shark
    - iii. Starting Wire shark
    - iv. Viewing Captured Traffic
    - v. Analysis and Statistics & Filters.
11. How to run Nmap scan
12. Operating System Detection using Nmap
13. Do the following using NS2 Simulator
    - i. NS2 Simulator-Introduction
    - ii. Simulate to Find the Number of Packets Dropped
    - iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    - iv. Simulate to Find the Number of Packets Dropped due to Congestion
    - v. Simulate to Compare Data Rate& Throughput.
    - vi. Simulate to Plot Congestion for Different Source/Destination
    - vii. Simulate to Determine the Performance with respect to transmission of Packets

**Text Books:**

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 6th Edition, PEARSON.
2. James F.Kurose, Keith W. Ross, Computer Networking: A Top-Down 6th edition, Pearson, 2019.
3. Computer Networks: A Systems Approach-Bruce Davie, VMware-Larry Peterson, Princeton University-2019.

**Reference Books:**

1. Computer Networks–B. K. MathanNagan, T. Mahalakshmi- Charulatha Publications PrivateLimited-2019.
2. Computer Networks-Dr.Amol V. Dhumane Nitin N. Sakhare-NiraliPrakashan Publishers-2024
3. Data Communications and Networking with TCPIP Protocol Suite-Behrouz A. Forouzan McGraw Hill-6th Edition

**Web Reference:**

1. **https://onlinecourses.nptel.ac.in/noc20_cs23/preview**
2. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview

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**B.Tech III Year I Semester**

| FULL STACK DEVELOPMENT - II (Common to CSE aligned Branches) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0527P** | **0: 1:2:0** | **2** | **CIE:30 SEE:70** | **3 Hours** | **SE** |

**Course Objectives:**

This course will enable students:

- Make use of Modern- day JavaScript with ES6 standards for designing Dynamic web pages
- Building robust & responsive User Interfaces using popular JavaScript library _React.js‘. Building robust backend APIs using _Express. js‘
- Establishing the connection between frontend (React) User interfaces and backend APIs (Express) with Data Bases(My SQL
- Familiarize students with GitHub for remote repository hosting and collaborative development.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- CO1: Building fast and interactive UIs
- CO2: Applying Declarative approach for developing web apps
- CO3: Understanding ES6 features to embrace modern JavaScript
- CO4: Building reliable APIs with Express. Js
- CO5: Create and manage Git repositories, track changes, and push code to GitHub.

| **Syllabus** | **Total Hours:48** |
|---|---|

**Experiments covering the Topics:**

- Introduction to DOM (Document Object Model), Ecma Script (ES6) standards and features like Arrow functions, Spread operator, Rest operator, Type coercion, Type hoisting, String literals, Array and Object Destructuring.
- Basics of React. js like React Components, JSX, Conditional rendering Differences between Real DOM and Virtual DOM.
- Important React.js concepts like React hooks, Props, React forms, Fetch API, Iterative rendering using JavaScript map() function.
- JavaScript runtime environment node. js and its uses, Express. js and Routing, Micro-Services architecture and MVC architecture, database connectivity using (My SQL)
- Introduction to My SQL, setting up MySQL and configuring, Databases, My SQL queries, subqueries, creating My SQL driver for database connectivity to Express. js server.
- Introduction to Git and GitHub and upload project& team collaboration

**Sample Experiments:**

1. **Introduction to Modern JavaScript and DOM**
   a. Write a JavaScript program to link JavaScript file with the HTML page
   b. Write a JavaScript program to select the elements in HTML page using selectors
   c. Write a JavaScript program to implement the event listeners
   d. Write a JavaScript program to handle the click events for the HTML button elements
   e. Write a JavaScript program to With three types of functions
      **i.** Function declaration
      **ii.** Function definition
      **iii.** Arrow functions

**2. Basics of React. Js**

a. Write a React program to implement a counter button using react class components
b. Write a React program to implement a counter button using react functional components
c. Write a React program to handle the button click events in functional component
d. Write a React program to conditionally render a component in the browser
e. Write a React program to display text using String literals

**3. Important concepts of React. js**

a. Write a React program to implement a counter button using React use State hook
b. Write a React program to fetch the data from an API using React use Effect hook
c. Write a React program with two react components sharing data using Props.
d. Write a React program to implement the forms in react
e. Write a React program to implement the iterative rendering using map() function.

4. **Introduction to Git and GitHub**

**a. Setup**

- Install Git on local machine.
- Configure Git (user name, email).
- Create GitHub account and generate a personal access token.

**b. Basic Git Workflow**

- Create a local repository using git init
- Create and add files → git add .
- Commit files → git commit -m "Initial commit"
- Connect to GitHub remote → git remote add origin
- Push to GitHub → git push -u origin main

**c. Branching and Collaboration**

- Create a branch → git checkout -b feature1
- Merge branch to main → git merge feature1
- Resolve merge conflicts (guided)

5. **Upload React Project to GitHub**

- Create a new React app using npx create-react-app myapp
- Initialize a git repo and push to GitHub
- Use .gitignore to exclude node_modules
- Create multiple branches: feature/navbar, feature/form
- Practice merge and pull requests (can use GitHub GUI)

6. **Introduction to Node. js and Express. js**

a. Write a program to implement the _hello world‘ message in the route through the browser using Express
b. Write a program to develop a small website with multiple routes using Express. js
c. Write a program to print the _hello world‘ in the browser console using Express. js
d. Write a program to implement the CRUD operations using Express. Js
e. Write a program to establish the connection between API and Database using Express –My SQL driver

7. **Introduction to My SQL**

- Write a program to create a Database and table inside that database using My SQLCommand line client
- Write a My SQL queries to create table, and insert the data, update the data in the table
- Write a My SQL queries to implement the subqueries in the My SQL command line client
- Write a My SQL program to create the script files in the My SQL workbench
- Write a My SQL program to create a database directory in Project and initialize a database. sql file to integrate the database into API

8. Team Collaboration Using GitHub
   - Form groups of 2–3 students
   - Create a shared GitHub repo
   - Assign tasks and work in branches
   - Use Issues, Pull Requests, and Code Reviews o Document code with README.md

**Text Books:**


1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas
2. John Dean, Web Programming with HTML5, CSS and JavaScript, Jones & Bartlett Learning, 2019.
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.
4. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon
5. AZAT MARDAN, Full Stack Java Script: Learn Back bone. js, Node.jsand Mongo DB.2015


**Reference Books:**


1. Full-Stack JavaScript Development by Eric Bush.
2. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
3. Tomasz Dyl , Kamil Przeorski , Maciej Czarnecki, Mastering Full Stack React Web Development 2017.


**Web References:**


1. https://ict.iitk.ac.in/product/full-stack-developer-html5-css3-js-bootstrap-php-4/
2. https://www.w3schools.com/html
3. https://www.w3schools.com/css
4. https://www.w3schools.com/js/
5. https://www.w3schools.com/nodejs
6. https://www.w3schools.com/typescript
7. https://docs.github.com/
8. https://education.github.com/git-cheat-sheet-education.pdf

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## B.Tech III Year I Semester

### TINKERING LAB
(Common to All branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0420 | 0:0:2:0 | 1 | CIE:30 SEE:70 | 3 Hours | MC |

**Course Objectives:**

The objectives of the course are to

- Encourage Innovation and Creativity
- Provide Hands-on Learning and Impart Skill Development
- Foster Collaboration and Teamwork
- Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
- Impart Problem-Solving mind-set

**Course Outcomes (CO):**

- These labs bridge the gap between academia and industry, providing students with the practical experience.
- Some students may also develop entrepreneurial skills, potentially leading to start-ups or innovation-driven careers.
- Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.
- The students will be able to experiment, innovate, and solve real-world challenges.

**Syllabus**

**List of Experiments**

1. Make your own parallel and series circuits using breadboard for any application of your choice.
2. Design and 3D print a Walking Robot
3. Design and 3D Print a Rocket.
4. Temperature & Humidity Monitoring System (DHT11 + LCD)
5. Water Level Detection and Alert System
6. Automatic Plant Watering System
7. Bluetooth-Based Door Lock System
8. Smart Dustbin Using Ultrasonic Sensor
9. Fire Detection and Alarm System
10. RFID-Based Attendance System
11. Voice-Controlled Devices via Google Assistant
12. Heart Rate Monitoring Using Pulse Sensor
13. Soil Moisture-Based Irrigation
14. Smart Helmet for Accident Detection
15. Milk Adulteration Detection System
16. Water Purification via Activated Carbon
17. Solar Dehydrator for Food Drying
18. Temperature-Controlled Chemical Reactor
19. Ethanol Mini-Plant Using Biomass
20. Smart Fluid Flow Control (Solenoid + pH Sensor)
21. Portable Water Quality Tester
22. AI Crop Disease Detection
23. AI-based Smart Irrigation

24. ECG Signal Acquisition and Plotting 28 B.Tech - CSE R23 Regulation
25. AI-Powered Traffic Flow Prediction
26. Smart Grid Simulation with Load Monitoring
27. Smart Campus Indoor Navigator
28. Weather Station Prototype
29. Firefighting Robot with Sensor Guidance
30. Facial Recognition Dustbin
31. Barcode-Based Lab Inventory System
32. Growth Chamber for Plants
33. Biomedical Waste Alert System
34. Soil Classification with AI
35. Smart Railway Gate
36. Smart Bin Locator via GPS and Load Sensors
37. Algae-Based Water Purifier
38. Contactless Attendance via Face Recognition

**References:**


1. https://aim.gov.in/pdf/equipment-manual-pdf.pdf
2. https://atl.aim.gov.in/ATL-Equipment-Manual/
3. https://aim.gov.in/pdf/Level-1.pdf
4. https://aim.gov.in/pdf/Level-2.pdf
5. https://aim.gov.in/pdf/Level-3.pdf

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| B.Tech III Year II Semester (Theory-6, Lab-2, SE-1, MC-1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | PC | 23A0529T | Machine Learning | 3 | 0 | 0 | 3 |
| 2 | PC | 23A0530T | Cloud Computing | 3 | 0 | 0 | 3 |
| 3 | PC | 23A0531T | Cryptography & Network Security | 3 | 0 | 0 | 3 |
| 4 | PE | 23A0532Ta<br>23A0532Tb<br>23A0532Tc<br>23A0449T | **Professional Elective-II**<br>Software Testing Methodologies<br>Cyber Security<br>DevOps<br>Embedded Systems Design | 3 | 0 | 0 | 3 |
| 5 | PE | 23A0533Ta<br>23A0533Tb<br>23A0533Tc<br>23A0533Td | **Professional Elective-III**<br>Software Project Management<br>Mobile Adhoc Networks<br>Natural Language Processing<br>Distributed Operating System | 3 | 0 | 0 | 3 |
| 6 | OE | | Open Elective – II | 3 | 0 | 0 | 3 |
| 7 | PC | 23A0534T | Machine Learning Lab | 0 | 0 | 3 | 1.5 |
| 8 | PC | 23A0535P | Cryptography & Network Security Lab | 0 | 0 | 3 | 1.5 |
| 9 | SE | 23A0026T | **Skill Enhancement Course**<br>Soft skills OR IELTS | 0 | 1 | 2 | 2 |
| 10 | MC | 23A0053T | **Audit Course**<br>Technical Paper Writing & IPR | 2 | 0 | 0 | - |
| 11 | PC | 23A0536 | Workshop | 0 | 0 | 0 | 0 |
| **Total** | | | | **20** | **1** | | **23** |
| Mandatory Industry Internship of 08 weeks duration during summer vacation | | | | | | | |

| **Category** | **Credits** |
|---|---|
| Professional Core Courses(PC) | 12 |
| Professional Elective Courses(PE) | 6 |
| Open Elective Courses(OE) | 3 |
| Skill Enhancement Course(SE) | 2 |
| Mandatory Course(MC) | - |
| Total | 23 |

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## Open Elective – II

| Sl. No. | Course Code | Course Title | Offered by the Dept |
|---|---|---|---|
| 1 | 23A0150T | Disaster Management | CIVIL |
| 2 | 23A0151T | Sustainability in Engineering Practices | CIVIL |
| 3 | 23A0232T | Renewable Energy Sources | EEE |
| 4 | 23A0334Tb | Automation and Robotics | ME |
| 5 | 23A0443T | Digital Electronics | ECE |
| 6 | 23A0030T | Optimization Techniques for Engineers | Mathematics |
| 7 | 23A0029T | Mathematical Foundation Of Quantum Technologies | Mathematics |
| 8 | 23A0035T | Physics Of Electronic Materials And Devices | Physics |
| 9 | 23A0041T | Chemistry Of Polymers And Applications | Chemistry |
| 10 | 23A0045T | Academic Writing and Public Speaking | Humanities |

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**B.Tech III Year II Semester**

| MACHINE LEARNING (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0529T** | **3: 0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **PC** |

**Course Objectives:**

The course is introduced for students to

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Apply Dimensionality reduction techniques for data preprocessing
- Explain what is learning and why it is essential in the design of intelligent machines
- Evaluate Advanced learning models for language, vision, speech, decision making etc.

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Introduction to Machine Learning & Preparing to Model** | **8Hrs** |

**Introduction to Machine Learning**: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

| | | |
|---|---|---|
| **Unit-II** | **Modelling and Evaluation & Basics of Feature Engineering** | **8Hrs** |

**Nearest Neighbor-Based Models:** Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

| | | |
|---|---|---|
| **Unit-III** | **Bayesian Concept Learning & Supervised Learning: Classification** | **9Hrs** |

**Models Based on Decision Trees:** Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.

**The Bayes Classifier:** Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

| Unit-IV | Supervised Learning: Regression | 9Hrs |
|---|---|---|
| **Linear Discriminants for Machine Learning:** Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP | | |
| **Unit-V** | **Unsupervised Learning** | **9Hrs** |
| **Clustering :** Introduction to Clustering, Partitioning of Data, Matrix Factorization \| Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering. | | |

**Text Books:**

1. Machine Learning Theory and Practice‖, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024.

**Reference Books:**

1. Machine Learning‖, Tom M. Mitchell, McGraw-Hill Publication, 2017
2. Machine Learning in Action‖,Peter Harrington, DreamTech
3. Introduction to Data Mining‖, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

**Web Reference:**

1. https://onlinecourses.nptel.ac.in/noc20_cs29/preview
2. https://nptel.ac.in/courses/106106139

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## B.Tech III Year II Semester

| CLOUD COMPUTING (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0530T** | **3:0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **PC** |

**Course Objectives:**

The course is introduced for students to
- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

**Course Outcomes (CO):**

After completion of the course, students will be able to
- Ability to create cloud computing environment
- Ability to design applications for Cloud environment
- Design & develop back up strategies for cloud data based on features.
- Use and Examine different cloud computing services.
- Apply different cloud programming model as per need

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Basics of Cloud computing** | **9Hrs** |

**Introduction to cloud computing**: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

**Cloud concepts and Technologies**: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

**Cloud Services and Platforms:** Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

| **Unit-II** | **Hadoop and Python** | **8Hrs** |
|---|---|---|

**Hadoop Map Reduce**: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.

**Cloud Application Design:** Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

**Python Basics:** Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

| **Unit-III** | **Python for Cloud Computing** | **8Hrs** |
|---|---|---|

**Python for Cloud:** Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for Map Reduce, Python packages of Interest, Python web Application Frame work, Designing a REST ful web API.

**Cloud Application Development in Python:** Design Approaches, Image Processing APP, Document Storage App, Map Reduce App, Social Media Analytics App.

| Unit-IV | Big data, Multimedia and Tuning | 12Hrs |
|---|---|---|

**Big Data Analytics:** Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.

**Multimedia Cloud:** Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.

**Cloud Application Bench marking and Tuning:** Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study

| Unit-V | Applications and Issues in Cloud | 12Hrs |
|---|---|---|

**Cloud Security:** Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

**Cloud for Industry, Health care & Education:** Cloud Computing for Health care, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

**Migrating into a Cloud:** Introduction, Broad Approaches to migrating into the cloud, the seven– step model of migration into a cloud.

**Organizational readiness and Change Management in The Cloud Age:** Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self – assessment.

**Legal Issues in Cloud Computing:** Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issue raised by virtualization and data location, commercial and business considerations, Special Topics.

**Text Books:**

1. Cloud computing A hands-on Approach By Arshdeep Bahga,Vijay Madisetti, Universities Press, 2016
2. Cloud Computing Principles and Paradigms: By Raj Kumar Buyya, James Broberg, Andrzej, Goscinski,Wiley,2016

**Reference Books:**

1. Mastering Cloud Computing by Raj kumar Buyya, Christian Vecchiola, SThamarai Selvi, TMH
2. Cloud computing A Hands-On Approach by Arshdeep Bahga and Vijay Madisetti.
3. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud,George Reese, O Reilly, SPD, rp2011
6. Essentials of Cloud Computing by K.Chandrasekaran. CRC Press.

**Web References:**

1. Cloud computing- Course (nptel.ac.in)

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**B.Tech III Year II Semester**

| **CRYPTOGRAPHY & NETWORK SECURITY**<br>(Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0531T** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **PC** |

**Course Objectives:**

This course aim sat training students to master the:

- The concepts of classical encryption techniques and concepts of finite fields and number theory
- Working principles and utilities of various crypto graphic algorithms including secret key crypto graphy, hashes, and message digests, and public key algorithms
- Design issues and working principles of various authentication protocols, PKI standards
- Various secure communication standards including Kerberos, I Psec, TLS and email
- Concepts of crypto graphic utilities and authentication mechanisms to design secure applications

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts off in it fields and number theory
- Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
- Apply the knowledge of crypto graphic check sums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
- Demonstrate the ability to apply **user authentication principles** including **Kerberos** for secure authentication
- Gain proficiency in securing web communications using **TLS** and **HTTPS**, manage secure remote access with **SSH**, and design **firewall policies**

| | **Syllabus** | **Total Hours:44** |
|---|---|---|
| **Unit-I** | **Computer and Network Security Concepts** | **9Hrs** |

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Classical Encryption Techniques: Sym metric Cip her Model, Substitution Techniques, Transposition Techniques, Steganography, Block Ciphers: Traditional Block Cipher Structure, The Data Encryption Standard, Advanced Encryption Standard: AES Structure, AES Transformation Functions

| | | |
|---|---|---|
| **Unit-II** | **Number Theory** | **9Hrs** |

The Euclidean Algorithm, Modular Arithmetic, Fermat‘s and Euler‘s Theorems, The Chinese Remainder Theorem, Discrete Logarithms, Finite Fields: Finite Fields of the Form GF(p), Finite Fields of the Form GF(2n) .Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

| | | |
|---|---|---|
| **Unit-III** | **Cryptographic Hash Functions** | **9Hrs** |

Application of Cryp to graphic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC &CMAC. Digital Signatures: NIST Digital Signature Algorithm, Distribution of Public Keys, X.509 Certificates, Public- Key Infrastructure

| Unit-IV | User Authentication | 9Hrs |
|---|---|---|
| Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME. IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange | | |
| **Unit-V** | **Transport Level Security** | **8Hrs** |
| Web Security Requirements, Transport Layer Security (TLS), HTTPS, Secure Shell (SSH)<br>Fire walls: Fire wall Character is tics and Access Policy, Types of Fire walls, Fire wall Location and Configurations. | | |

**Textbooks:**

1. Cryptography and Network Security – William Stallings, Pearson Education, 8th Edition.
2. Cryptography, Network Security and Cyber Laws–Bernard Menezes, Cengage Learning, 2010 edition.

**Reference Books:**

1. Cryptography and Network Security-BehrouzA Forouzan, Debdeep Mukhopadhyaya, Mc- Graw Hill, 3rd Edition, 2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003..

**Web Resources:**

1. https://nptel.ac.in/courses/106/105/106105031 /lecture
2. https://nptel.ac.in/courses/106/105/106105162 / lecture by Dr.SouravMukhopadhyay IIT Kharagpur [ VideoLecture]
3. https://www.mitel.com/articles/web-communication-cryptography-and-network-security web articles by Mitel Power Connections

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**B.Tech III Year II Semester**

**SOFTWARE TESTING METHODOLOGIES**
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0532Ta | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PE |

**Course Objectives:**

This course will enable students to:
- To study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
- To discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.
- It also helps to learn the types of bugs, testing levels with which the student can very well identify a bug and correct as when it happens.
- It provides knowledge on transaction flow testing and data flow testing techniques so that the flow of the program is tested as well.
- To learn the domain testing, path testing and logic based testing to explore the testing process easier.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**
- Know the basic concepts of software testing and its essentials.
- Able to identify the various bugs and correcting them after knowing the consequences of the bug.
- Use of program‘s control flow as a structural model is the corner stone of testing.
- Performing functional testing using control flow and transaction flow graphs.

| | Syllabus | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction, Flow graphs and Path testing** | **10Hrs** |

**Introduction:-**Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.

**Flow graphs and Path testing**:- Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

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| **Unit-II** | **Transaction Flow Testing, Dataflow testing** | **9Hrs** |

**Transaction Flow Testing**:-transaction flows, transaction flow testing techniques.

**Dataflow testing**:- Basics of dataflow testing, strategies in dataflow testing, application of data flow testing.

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| **Unit-III** | **Domain Testing** | **10Hrs** |

**Domain Testing**:-domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

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|---|---|---|
| **Unit-IV** | **Paths, Path products and Regular expressions, Logic Based Testing** | **9Hrs** |

**Paths, Path products and Regular expressions**:- path products & paths expression, reduction procedure, applications, regular expressions & flow anomaly detection.

**Logic Based Testing**:-over view, decision tables, path expressions, kv charts, specifications.

| Unit-V | State, State Graphs and Transition testing, Graph Matrices and Application | 10Hrs |
|---|---|---|

**State, State Graphs and Transition testing**:- state graphs, good & bad state graphs, state testing, Testability tips.

**Graph Matrices and Application**:-Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools.

**Text Books:**

- Software Testing techniques – Boris Beazer, Dramatic, second edition.
- Software Testing Tools – Dr. K.V.K.K. Prasad, Dramatic.

**Reference Books:**

- The craft of software testing – Brian Marwick, Pearson Education.
- Software Testing Techniques – SPD(Orville)
- Software Testing in the Real World – Edward Kit, Pearson.
- Effective methods of Software Testing, Perry, John Wiley.
- Art of Software Testing – Meyers, John Wiley.

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**B.Tech III Year II Semester**

**CYBER SECURITY**
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0532Tb | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PE |

**Course Objectives:**

The course is designed to provide awareness on different cyber-crimes, cyber offenses, tools and methods used in cybercrime.

**Course Outcomes (CO):**

**After completion of the course, students will be able to**

- Classify the cybercrimes and understand the Indian ITA 2000
- Analyse the vulnerabilities in any computing system and find the solutions
- Predict the security threats of the future
- Investigate the protection mechanisms
- Design security solutions for organizations

| Syllabus | | Total Hours:42 |
|---|---|---|
| **Unit-I** | **Introduction to Cybercrime** | **8Hrs** |

**Introduction**, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

| | | |
|---|---|---|
| **Unit-II** | **Cyber Offenses: How Criminals Plan Them** | **9Hrs** |

**Introduction**, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

| | | |
|---|---|---|
| **Unit-III** | **Cybercrime: Mobile and Wireless Devices** | **9Hrs** |

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones,

Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

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| **Unit-IV** | **Tools and Methods Used in Cybercrime** | **8Hrs** |

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

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| **Unit-V** | **Cyber Security: Organizational Implications** | **8Hrs** |

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

**Text Books:**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

**Reference Books:**

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan- Hwa(john) Wu,J. David Irwin.CRC Press T&F Group

**Web Resources:**

1. http://nptel.ac.in/courses/106105031/40
2. http://nptel.ac.in/courses/106105031/39
3. http://nptel.ac.in/courses/106105031/38

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## B.Tech III Year II Semester

**DevOps**
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0532Tc | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PE |

**Course Objectives:**

This course will enable students to:

- Understand collaboration and productivity by automating infrastructure and workflows
- Familiarize with continuous measuring applications performance

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT serviceability
- Describe Dev Ops &Dev Sec Ops methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Dev Ops** | **9Hrs** |

An Overview, DevOps: Origins, DevOps: Roots, Dev Ops: Practices DevOps: Culture.

**Adopting DevOps**: Developing the Playbook. Developing a Business Case for a DevOps: Developing the Business Case

| **Unit-II** | **Completing the Business Model** | **10Hrs** |
|---|---|---|

Completing the Business Model Canvas, Customer Segments, Value Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structures. DevOps Plays for optimizing the delivery Pipeline: DevOps as an optimization Exercise, Core Themes, The DevOps Plays, Specializing Core Plays

| **Unit-III** | **DevOps Plays for Driving Innovation** | **10Hrs** |
|---|---|---|

Optimize to Innovate, The Umber Syndrome, Innovation and the Role of Technology, Core Themes, play: Build a DevOps Platform, play: Deliver Micro services Architectures, play: Devious an API Economy, play: Organizing for Innovation.

| **Unit-IV** | **Scaling DevOps for the Enterprise** | **10Hrs** |
|---|---|---|

Core Themes, play: Dev Ops Centre of Competency, play: Developing Culture of Innovation at Scale, play: Developing a Culture of continuous Improvement, play: Team Models for DevOps, play: Standardization of Tools and Process, play: Security Considerations for DevOps, Play: DevOps and Outsourcing.

| **Unit-V** | **Leading DevOps Adoption in the Enterprise** | **9Hrs** |
|---|---|---|

Play: DevOps as a transformation Exercise, play: Developing a Culture of Collaboration and Trust, play: DevOps Thinking for the Line of Business, play: starting with Pilot Projects, Play: Rearing Unicorns on an Aircrafts Carrier. Appendix Case Study: Example DevOps Adoption Roadmap Organization Background, Roadmap Structure, Adoption Roadmap.

**Text Books:**

1. Sanjeev Sharma, The Devious Adoption Playbook, Published by John Wiley & Sons, Inc.2017

**Reference Books:**

1. Sanjeev Sharma & Bernie Coyne, Devious for Dummies, Published by John Wiley & Sons, Inc.
2. Michael Hotelman, Devious for Developers, Après publishers,2012.

**Web References:**

Learning Dev Ops with Terra form Infrastructure Automation Course | Udemy

**B.Tech III Year II Semester**

| EMBEDDED SYSTEM DESIGN (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0449T** | **3:0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **PE** |

**Course Objectives:**

This course will enable students to:

- To understand the history, classification, and design process of embedded systems.
- To explore the core components of embedded systems, including processors, memory, and I/O components.
- To introduce onboard and external communication interfaces used in embedded systems.
- To explain different firmware design approaches and programming techniques for embedded systems.
- To provide an understanding of real-time operating systems and task management in embedded systems.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Classify embedded systems based on their purpose, generation, and complexity.
- Identify and select appropriate hardware components for an embedded system design.
- Differentiate and implement various communication protocols like I2C, SPI, and CAN.
- Develop firmware using assembly and high-level programming languages.
- Analyze and apply RTOS-based task scheduling and synchronization techniques.

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Introduction to Embedded Systems** | **9Hrs** |

Introduction to Embedded Systems: History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.

| **Unit-II** | **Typical Embedded System** | **10Hrs** |
|---|---|---|

**Typical Embedded System**:Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

| **Unit-III** | **Communication Interface** | **10Hrs** |
|---|---|---|

Onboard communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBe, GPRS, GSM.

| **Unit-IV** | **Embedded Firmware Design and Development** | **10Hrs** |
|---|---|---|

Embedded Firmware Design and Development:Embedded firmware design approaches-super loop based approach, operating system based approach; embedded firmware development languages-assembly language based development, high level language based development.

| Unit-V | RTOS based Embedded System Design | 9Hrs |
|---|---|---|

Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and pre-emptive scheduling; task communication shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques

**Text Books:**

1. Introduction to Embedded Systems - Shibu KV, McGraw Hill Education.
2. Computers as Components –Wayne Wolf, Morgan Kaufmann (second edition).

**Reference Books:**

1. Embedded System Design -Frank Vahid, Tony Grivargis, john Wiley.
2. Embedded Systems- An integrated approach - Lyla b das, Pearson education 2012.
3. Embedded Systems – Raj Kamal, TMH

**Web Resources:**

1. **https://onlinecourses.nptel.ac.in/noc23_cs54/preview**
2. **https://nptel.ac.in/courses/106105159**

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**B.Tech III Year II Semester**

| SOFTWARE PROJECT MANAGEMENT (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0533Ta** | **3: 0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **PE** |

**Course Objectives:**

This course is designed to enable the students thunders and the fundamental principles of Software Project management & will also have a good knowledge of the responsibilities of a project manager and how to handle them.

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Describe the fundamentals of Project Management
- Recognize and use Project Scheduling Techniques
- Familiarize with Project Control Mechanisms
- Understand Team Management
- Recognize the importance of Project Documentation and Evaluation

| **Syllabus** | **Total Hours:45Hrs** |
|---|---|
| **Unit-I** | **9Hrs** |

Convention a software Management: The water fall model, convention a software Management performance Evolution of Software Economics: software Economics. Pragmatic Software Cost Estimation improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

| **Unit-II** | **9Hrs** |
|---|---|

The old way and the new: The principles of convention a software Engineering, principles of moderns of tare management, transitioning to an iterative process. Lifecycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artefacts of the process: Their defect sets, Management artefacts, Engineering artefacts, programmatic artefacts

| **Unit-III** | **9Hrs** |
|---|---|

Work Flows of the process: Software process work flows, Inter Tran work flows. Check points of the Process: Major Milestones, Minor Milestones, Periodic status assessments. Iterative Process Planning: work break down structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

| **Unit-IV** | **9Hrs** |
|---|---|

Process Automation: Automation Building Blocks, the Project Environment. Project Control and Process instrumentation: These encore Metrics, Management indicators, quality indicators Tailoring the Process: Process discriminates. Managing people and organizing teams.

| **Unit-V** | **9Hrs** |
|---|---|

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations. Future Software Project Management: modern Project Profiles, Next generation Software economics, modern process transitions. Case Study: The Command Center Processing and Display System- Replacement (CCPDS-R)

**Text Books:**

1. Software Project Management, Walker Royce ,Pearson Education,2012
2. Bob Hughes ,Mike Cottrell and Rajib Mall ―Soft ware Project Management‖, 6th Edition, Mc Grow Hill Edition, 2017

**Reference Books:**

1. Pankaj Jalote,―Software Project Management inpractice‖,5th Edition, Pearson Education, 2017.
2. Murali K. Chemuturi, Thomas M.Cagley Jr.‖Mastering Software Project Management: Best Practices, Tools and Techniques‖,J.RossPublishing,2010
3. Sanjay Mohapatra,―Software Project Management‖,Cengage Learning,2011

**Web References:**

1. http://nptel.ac.in/courses/106101061/29

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## B.Tech III Year II Semester

### MOBILE ADHOC NETWORKS
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0533Tb | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PE |

**Course Objectives:**

This course will enable students to:

- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- Knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
- Knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.

**Course Outcomes (CO):**

- Describe the unique issues in ad-hoc/sensor networks
- Describe current technology trends for the implementation and deployment of wireless ad hoc/sensor networks.
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad hoc/sensor networks.
- Discuss the challenges in designing routing and transport protocols for wireless Adhoc/sensor networks.
- Comprehend the various sensor network Platforms, tools and applications

| | Syllabus | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction to Ad Hoc Networks:** | **9Hrs** |

Characteristics of MANETs, Applications of MANETs and challenges of MANETs -Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.

| | | |
|---|---|---|
| **Unit-II** | **Data Transmission:** | **10Hrs** |

Data Transmission: Broadcast storm problem, Broadcasting, Multicasting and Geocasting -TC Pover Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

| | | |
|---|---|---|
| **Unit-III** | **Basics of Wireless, Sensors and Applications:** | **10Hrs** |

Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

| | | |
|---|---|---|
| **Unit-IV** | **Data Retrieval in Sensor Networks:** | **10Hrs** |

Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots-Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

| | | |
|---|---|---|
| **Unit-V** | **Sensor Network Platforms and Tools:** | **9Hrs** |

Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms -Operating System: Tiny OS -Imperative Language: nesC, Data flow style language: Tiny GALS, Node Level Simulators, ns 2 and its sensor network extension.

**Text Books:**

1. Ad Hoc and Sensor Networks –Theory and Applications, Carlos Corderio Dharma P. Aggarwal,World Scientific Publications, March 2006,ISBN –981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN –978-1-55860-914-3 ( Morgan Kauffman)

**Web References:**

1. **https://onlinecourses.nptel.ac.in/noc25_cs74/preview**
2. **https://onlinecourses.nptel.ac.in/noc25_cs74/preview**

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**B.Tech III Year II Semester**

| NATURAL LANGUAGE PROCESSING (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0533Tc** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **PE** |

**Course Objectives:**

- Explain and apply fundamental algorithms and techniques in the area of natural language processing(NLP)
- Discuss approaches to syn tax and semantics in NLP.
- Examine current methods for statistical approaches to machine translation
- Teach machine learning techniques used in NLP.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Understand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python
- Apply the various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy
- Understand the fundamentals of CFG and parsers and mechanisms in ATN's.
- Apply Semantic Interpretation and Language Modelling.
- Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

| | **Syllabus** | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Introduction to Natural language** | **9Hrs** |

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Back ground: Anoutline of English Syntax.

| | | |
|---|---|---|
| **Unit-II** | **Grammars and Parsing** | **10Hrs** |

Grammars and Parsing – Top – Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphologica l Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannongame, Entropy and Cross Entropy.

| | | |
|---|---|---|
| **Unit-III** | **Grammars for Natural Language** | **10Hrs** |

Grammars for Natural Language, Movement Phenomenonin Language, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

| | | |
|---|---|---|
| **Unit-IV** | **Semantic Interpretation & Language Modelling** | **10Hrs** |

**Semantic Interpretation**
Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, The maticroles, Speech acts & embedded sentences, Defining semantics structure model theory.

**Language Modelling**
Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.

| Unit-V | Machine Translation | 9Hrs |
|---|---|---|

**Machine Translation**
Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches ,Current Status .Anusarakaor Language Accessor: Background, Cutting the GordianKnot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

**Multilingual Information Retrieval**
Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

**Multilingual Automatic Summarization**
Introduction, Approach esto Summarization, Evaluation, How to Builda Summarizer, Competitions and Datasets.

**Text Books:**

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice- Daniel M.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineetchaitanya, Prentice –Hall of India.

**Reference Books:**

1. Charniack, Eugene, Statistical Language Learning, MITPress,1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall,2008.
3. Manning, Christopher and Hen rich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press,1999.

**Web Resources:**

1. https://nptel.ac.in/courses/106/105/106105158/
2. http://www.nptelvideos.in/2012/11/natural-language processing.html

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**B.Tech III Year II Semester**

| DISTRIBUTED OPERATING SYSTEMS (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0533Td** | **3: 0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **PE** |

**Course Objectives:**

This course will enable students:

- To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems)
- Hardware and software features that support these systems.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Understand the design approaches of advanced operating systems
- Analyze the design issues of distributed operating systems.
- Evaluate design issues of multi processor operating systems.
- Identify the requirements Distributed File System and Distributed Shared Memory.
- Formulate the solutions to schedule the real time applications.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Architectures of Distributed Systems** | **10Hrs** |

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. Theoretical Foundations: Inherent Limitations of a Distributed System, Lam port's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

| | | |
|---|---|---|
| **Unit-II** | **Distributed Mutual Exclusion** | **9Hrs** |

Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, Non-Token –Based Algorithms: Lamport's Algorithm, The Ricart-Agrawalsa Algorithm, Maekawa's Algorithm,Token-Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heurisric Algorithm,Raymond's Heuristic Algorithm.

| | | |
|---|---|---|
| **Unit-III** | **Distributed Deadlock Detection** | **10Hrs** |

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

| | | |
|---|---|---|
| **Unit-IV** | **Multiprocessor System Architectures** | **9Hrs** |

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling. Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

| **Unit-V** | **Distributed Scheduling** | **10Hrs** |
|---|---|---|

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues

**Text Books:**

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, Tata Mc Graw- Hill Edition 2001.

**Reference Books:**

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition –. 1, 2007

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3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
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**B.Tech III Year II Semester**

| DISASTER MANAGEMENT (CSE, ECE, EEE, ME) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0150T** | **3:0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

**The objectives of the course are to make the students learn about**
- To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
- To Analyse the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
- To apply wind engineering principles and computational techniques in designing wind-resistant structures.
- To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
- To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

**Course Outcomes(CO):**

**Upon completion of this course, students should be able to:**
- Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
- Analyse the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
- Apply wind engineering principles and computational techniques in designing wind-resistant structures.
- Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
- Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

| | **Syllabus** | **Total Hours:42** |
|---|---|---|
| **Unit – I** | **Introduction to Natural Disasters** | **9 Hrs** |
| Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences). | | |
| **Unit – II** | **Cyclones and Their Impact** | **9Hrs** |
| Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters. | | |
| **Unit – III** | **Wind Engineering and Structural Response** | **8 Hrs** |
| Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas. | | |

| **Unit - IV** | **Seismology and Earthquake Effects** | **8 Hrs** |
|---|---|---|
| Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicenter, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil Rupture, Liquefaction, Landslides. Performance of Ground and Buildings in Past Earthquakes– Behavior of Various Types of Buildings and Structures, Collapse Patterns; Behavior of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies. Seismic Retrofitting– Weakness in Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening. | | |
| **Unit - V** | **Planning and Design Considerations for Seismic Safety** | **8 Hrs** |
| General Planning and Design Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Storey Effects, Etc.; Seismic Effects Related to Building Configuration. Plan and Vertical Irregularities, Redundancy, and Setbacks. Construction Details– Various Types of Foundations, Soil Stabilization, Retaining Walls, Plinth Fill, Flooring, Walls, Openings, Roofs, Terraces, Parapets, Boundary Walls, Underground and Overhead Tanks, Staircases, and Isolation of Structures. Innovative Construction Materials and Techniques. Local Practices– Traditional Regional Responses. Computational Investigation Techniques. | | |

**Text Books:**

1. David Alexander, Natural Disasters, 1st Edition, CRC Press, 2017.
2. Edward A. Keller and Duane E. De Vecchio, Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, 5th Edition, Routledge, 2019.

**Reference Books:**

1. Ben Wisner, J.C. Gaillard, and Ilan Kelman (Editors), Handbook of Hazards and Disaster Risk Reduction and Management, 2nd Edition, Routledge, 2012.
2. Damon P. Coppola, Introduction to International Disaster Management, 4th Edition, Butterworth-Heinemann, 2020.
3. Bimal Kanti Paul, Environmental Hazards and Disasters: Contexts, Perspectives and Management, 2nd Edition, Wiley-Blackwell, 2020.

**Online Learning Resources:**

- https://nptel.ac.in/courses/124107010
- https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

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**B.Tech III Year II Semester**

**SUSTAINABILITY IN ENGINEERING PRACTICES**
**(CSE, ECE, EEE, ME)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0151T | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

**The objectives of the course are to make the students learn about**

- To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
- To Analyse sustainable construction materials, their durability, and life cycle assessment.
- To apply energy calculations in construction materials and assess their embodied energy.
- To evaluate green building standards, energy codes, and performance ratings.
- To assess the environmental effects of energy use, climate change, and global warming.

**Course Outcomes(CO):**

**Upon completion of this course, students should be able to:**

- Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
- Analyse sustainable construction materials, their durability, and life cycle assessment.
- Apply energy calculations in construction materials and assess their embodied energy.
- Evaluate green building standards, energy codes, and performance ratings.
- Assess the environmental effects of energy use, climate change, and global warming.

| Syllabus | | Total Hours:42 |
|---|---|---|
| **Unit – I** | **Introduction** | **9 Hrs** |
| Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO2 Contribution From Cement and Other Construction Materials. | | |
| **Unit – II** | **Materials Used in Sustainable Construction** | **9Hrs** |
| Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability. | | |
| **Unit – III** | **Energy Calculations** | **8 Hrs** |
| Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-Vis Operational Energy in Conditioned Building - Life Cycle Energy Use | | |
| **Unit – IV** | **Green Buildings** | **8 Hrs** |
| Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings – Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building | | |
| **Unit – V** | **Environmental Effects** | **8 Hrs** |
| Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change. | | |

**Text Books:**

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell, UK, 2016.

**Reference Books:**

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
2. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2012.

**Online Learning Resources:**

- https://archive.nptel.ac.in/courses/105/105/105105157/

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**B.Tech III Year II Semester**

| **RENEWABLE ENERGY SOURCES (Common To All Branches Except EEE)** | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0232T** | **3:0:0:0** | **3** | **CIE:30 & SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To understand solar radiation principles, measurement techniques, and geometric relationships for solar energy applications.
- To analyze flat plate and concentrating solar collectors for thermal energy conversion and storage systems.
- To comprehend photovoltaic effect principles in crystalline silicon and various PV technologies.
- To design and analyze stand-alone and grid-connected photovoltaic systems with proper electrical characteristics.
- To understand wind energy conversion principles and aerodynamic forces acting on wind turbine blades.
- To evaluate wind data, site selection criteria, and design considerations for horizontal and vertical axis wind machines.
- To estimate geothermal energy resources and understand various geothermal sources including hydrothermal and hot dry rock systems.
- To assess advantages, limitations, and applications of geothermal energy with focus on Indian prospects.
- To analyze ocean energy systems including tidal and wave energy conversion principles and their operational methods.
- To understand biomass conversion technologies, biogas generation, and fuel cell principles with their performance characteristics and applications.

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Understand principle operation of various renewable energy sources.
- Identify site selection of various renewable energy sources.
- Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomasss, Tidal Wave and Fuel cell energies
- Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems.
- Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power.

| **Syllabus** | | **Total Hours: 48Hrs** |
|---|---|---|
| **Unit-I** | **Solar Energy** | **10Hrs** |
| Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage. | | |
| **Unit-II** | **PV Energy Systems** | **9Hrs** |
| Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems.. | | |

| Unit -III | Wind Energy | 10Hrs |
|---|---|---|
| Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations.. | | |
| **Unit -IV** | **Geothermal Energy** | **10Hrs** |
| Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India. | | |
| **Unit -V** | **Miscellaneous Energy Technologies** | **9Hrs** |
| Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations. Wave Energy-Principle of working, energy and power from waves, wave energy conversion devices, advantages and limitations. Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration.<br>Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations. | | |

**Textbooks:**

1. G. D. Rai, Non-Conventional Energy Sources‖, 4th Edition, Khanna Publishers, 2000.
2. Chetan Singh Solanki ,Solar Photovoltaics fundamentals, technologies and applications‖ 2nd Edition PHI Learning Private Limited. 2012

**Reference Books:**

1. Stephen Peake, Renewable Energy Power for a Sustainable Future‖, Oxford International Edition, 2018.
2. S. P. Sukhatme, Solar Energy‖,3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
3. B H Khan , Non-Conventional Energy Resources‖, 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
4. S. Hasan Saeed and D.K.Sharma, Non-Conventional Energy Resources‖,3rd Edition, S.K.Kataria& Sons, 2012.
5. G. N. Tiwari and M.K.Ghosal, Renewable Energy Resource: Basic Principles and Applications‖, Narosa Publishing House, 2004.

**Online Learning Resources**:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

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## B.Tech III Year II Semester

| AUTOMATION AND ROBOTICS<br>(Common To All Branches Except ME) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0334Tb** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

This course will enable students to:

- Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.
- Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation
- Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.
- Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.
- Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.

**Course Outcomes (CO):**

After completion of the course, students will be able to:

- Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.
- Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.
- Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility.
- Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.
- Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks.

| Syllabus | | |
|---|---|---|
| **Module-I** | **Introduction to Automation** | **10 Hrs** |

Introduction to Automation, Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

| | | |
|---|---|---|
| **Module-II** | **Automated flow lines** | **10 Hrs** |

Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

| Module-III | Introduction to Industrial Robotics | 10 Hrs |
|---|---|---|
| Introduction to Industrial Robotics, Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers.<br><br>Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors. | | |
| **Module-IV** | **Manipulator Kinematics** | **9 Hrs** |
| Manipulator Kinematics, Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics. Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion. | | |
| **Module-V** | **Robot Programming** | **9 Hrs** |
| Robot Programming, Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages. Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection. | | |

**Textbooks:**


1. Automation , Production systems and CIM,M.P. Groover /Pearson Edu.
2. Industrial Robotics - M.P. Groover, TMH.


**Reference Books:**


1. Robotics , Fu K S, McGraw Hill, 4th edition, 2010.
2. An Introduction to Robot Technology, P. Coiffet and M. Chaironze, Kogam Page Ltd. 1983 London.
3. Robotic Engineering , Richard D. Klafter, Prentice Hall
4. Robotics, Fundamental Concepts and analysis – Ashitave Ghosal ,Oxford Press, 1/e, 2006
5. 5. Robotics and Control , Mittal R K &Nagrath I J , TMH.


**Online Learning Resources:**

1. https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmhl-gt76o
2. https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE

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**B.Tech III Year II Semester**

**DIGITAL ELECTRONICS**
**(Common To All Branches of Engineering Except ECE)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0443T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
- To analyze combinational circuits like adders, subtractors, and code converters.
- To explore combinational logic circuits and their applications in digital design.
- To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
- To gain knowledge about programmable logic devices and digital IC‘s.

**Course Outcomes (CO):**

After the completion of the course students will able to:

- Understand the Boolean algebra, logic simplification techniques
- Implement the minimization techniques for combinational circuit design
- Analyze the combinational circuits like adders, subtractors, multipliers and code converters
- Explore the combinational logic circuits and their applications in digital design
- Understand the sequential logic circuits, including latches, flip-flops, counters, and shift registers
- Understand the programmable logic devices and digital IC‘s

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Solar Energy** | **10Hrs** |

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan‘s Theorem, SOP& POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

| **Unit-II** | **PV Energy Systems** | **9Hrs** |
|---|---|---|

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Binary Multipliers, Code converters- Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

| **Unit -III** | **Wind Energy** | **10Hrs** |
|---|---|---|

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

| **Unit -IV** | **Geothermal Energy** | **10Hrs** |
|---|---|---|

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

| **Unit -V** | **Miscellaneous Energy Technologies** | **9Hrs** |
|---|---|---|

Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL).
Digital IC’s: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

**Textbooks:**

1. Digital Design, M. Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, Zvi Kohavi and Nirah K. Jha, 2nd Edition, Tata McGraw Hill, 2005.

**Reference Books:**

1. Fundamentals of Logic Design, Charles H Roth, Jr.,5th Edition, Brooks/cole Cengage Learning,2004.

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**B.Tech III Year II Semester**

## OPTIMIZATION TECHNIQUES
**(Common to all branches)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0030T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.
- Interpret the transportation models' solutions and infer solutions to the real-world problems.
- Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.
- Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives
- Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Linear programming I** | **10Hrs** |
| Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method | | |
| **Unit-II** | **Linear programming II: Duality in Linear Programming** | **9Hrs** |
| Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem | | |
| **Unit -III** | **Non-linear programming: Unconstrained optimization techniques** | **10Hrs** |
| Introduction: Classification of Unconstrained minimization methods, Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method | | |
| **Unit -IV** | **Non-linear programming: Constrained optimization techniques** | **10Hrs** |
| Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria. | | |
| **Unit -V** | **Geometric Programming** | **9Hrs** |
| Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.<br>Constrained minimization Problems: Solution of a constrained geometric programming problem, primal dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints. | | |

**Textbooks:**

1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.
2. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.

**Reference Books:**

1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.

**Web Reference:**

1. https://onlinecourses.nptel.ac.in/noc24_ee122/preview
2. https://archive.nptel.ac.in/courses/111/105/111105039/
3. https://onlinecourses.nptel.ac.in/noc21_ce60/preview

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## B.Tech III Year II Semester

| MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES (EEE,ME,ECE,CSE,AIML,DS,CS) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0029T** | **3:0:0:0** | **3** | **CIE:30 & SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.
- To develop understanding of the transition from finite-dimensional systems to infinite-dimensional function spaces and Hilbert space concepts.
- To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.
- To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.
- To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics.

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Understand vector spaces, inner products, and linear operators with applications to quantum systems.
- Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems.
- Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution.
- Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations.
- Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory.

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Linear Algebra Foundation for Quantum Mechanics** | **10Hrs** |

Vector spaces definition and examples ($R^2$, $R^3$, function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-dimensional examples (2×2 matrices, spin-1/2 systems), Dirac notation introduction ($|\psi\rangle$, $\langle\varphi|$, $\langle\varphi|\psi\rangle$), Change of basis (transformations, unitary matrices).

| | | |
|---|---|---|
| **Unit-II** | **From Finite to Infinite Dimensions** | **9Hrs** |

Function spaces ($L^2$ space, square-integrable functions), Inner products for functions ($\int\psi^*\varphi\, dx$), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx, multiplication by x).

| | | |
|---|---|---|
| **Unit-III** | **Quantum Mechanical Formalism** | **10Hrs** |

Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).

| Unit -IV | Applications and Statistical Interpretation | 10Hrs |
|---|---|---|
| Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme). | | |
| **Unit -V** | **Advanced Topics** | **9Hrs** |
| Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual). | | |

**Textbooks:**


1. David J. Griffiths, Darrell F. Schroeter, Introduction to Quantum Mechanics‖, 3rd Edition, Cambridge University Press (2018).
2. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).


**Reference Books:**


1. George. F. Simmons, Introduction to Topology and Modern Analysis,MedTech Science Press.
2. Gilbert Strang, Linear Algebra and Its Applications, 4th Edition, Cengage Learning (2006).
3. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics,Princeton Univ. Press (1996).


**Web Reference:**


1. https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf
2. https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf

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**B.Tech III Year II Semester**

## PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
**(Common to all branches of Engineering)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0035T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To make the students to understand the concept of crystal growth, defects in crystals and thin films.
- To provide insight into various semiconducting materials and their properties.
- To develop a strong foundation in semiconductor physics and device engineering.
- To elucidate excitonic and luminescent processes in solid-state materials.
- To understand the principles, technologies, and applications of modern display systems.

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Understand crystal growth and thin film preparation
- Summarize the basic concepts of semiconductors
- Illustrate the working of various semiconductor devices
- Analyze various luminescent phenomena and the devices based on these concepts
- Explain the working of different display devices

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Fundamentals of Materials Science** | **10Hrs** |

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

| | | |
|---|---|---|
| **Unit-II** | **Semiconductors** | **9Hrs** |

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electronhole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

| | | |
|---|---|---|
| **Unit-III** | **Physics of Semiconductor Devices** | **10Hrs** |

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, MOSFETs.

| | | |
|---|---|---|
| **Unit -IV** | **Excitons and Luminescence** | **10Hrs** |

Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials.
Photoluminescence : General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot.
Electro-luminescence : General Principles of electroluminescence, light emitting diode, diode laser.

| | | |
|---|---|---|
| **Unit -V** | **Display devices** | **9Hrs** |

LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.

**Textbooks:**

1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd.,4thedition, 2021.
2. Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.

**Reference Books:**

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition
2. Electronic Materials Science- Eugene A. Irene, Wiley, 2005
3. Electronic Components and Materials, Grover and Jamwal, DhanpatRai and Co., New Delhi., 2012.
4. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition,2011

**NPTEL course links:**

1. https://nptel.ac.in/courses/113/106/113106062/
2. https://onlinecourses.nptel.ac.in/noc20_ph24/preview

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**B.Tech III Year II Semester**

| CHEMISTRY OF POLYMERS AND APPLICATIONS (Common to all branches of Engineering) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| 23A0041T | **3:0:0** | **3** | **CIE:30 & SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To understand the basic principles of polymers
- To understand natural polymers and their applications.
- To impart knowledge to the students about synthetic polymers, their preparation and importance.
- To enumerate the applications of hydogel polymers
- To enumerate applications of conducting and degradable polymers in engineering

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer
- Describe the physical and chemical properties of natural polymers and Modified cellulosics.
- Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers.
- Identify types of polymer networks, Describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery,
- Explain classification and mechanism of conducting and degradable polymers.

| **Syllabus** | | **Total Hours: 48Hrs** |
|---|---|---|
| **Unit-I** | **Polymers-Basics and Characterization** | **10Hrs** |

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, copolymerization and coordination polymerization.

Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

| | | |
|---|---|---|
| **Unit-II** | **Natural Polymers & Modified cellulosics** | **9Hrs** |

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.

Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

| | | |
|---|---|---|
| **Unit-III** | **Synthetic Polymers** | **10Hrs** |

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers(PE,PVC), Butadiene polymers(BUNA-S,BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins.

| | | |
|---|---|---|
| **Unit -IV** | **Hydrogels of Polymer networks** | **10Hrs** |

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

| Unit -V | Conducting and Degradable Polymers | 9Hrs |
|---|---|---|
| **Conducting polymers**: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping,Applications. <br> **Degradable polymers**: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications. | | |

**Textbooks:**

1. A Text book of Polymer science, Billmayer
2. Polymer Chemistry – G.S.Mishra
3. Polymer Chemistry – Gowarikar

**Reference Books:**

1. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
2. Advanced Organic Chemistry, B.Miller, Prentice Hall
3. Polymer Science and Technology by Premamoy Ghosh, 3rd edition, McGraw-Hill, 2010.

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**B.Tech III Year II Semester**

## ACADEMIC WRITING AND PUBLIC SPEAKING
**(Common to All Branches of Engineering)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0045T | 3:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To encourage all round development of the students by focusing on writing skills
- To make the students aware of non-verbal skills
- To develop analytical skills
- To deliver effective public speeches

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Understand various elements of Academic Writing
- Identify sources and avoid plagiarism
- Demonstrate the knowledge in writing a Research paper
- Analyse different types of essays
- Assess the speeches of others and know the positive strengths of speakers

Build confidence in giving an impactful presentation to the audience

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Introduction to Academic Writing** | **10Hrs** |
| Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing | | |
| **Unit-II** | **Academic Journal Article** | **9Hrs** |
| Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing -Editing, Proof Reading – Plagiarism | | |
| **Unit-III** | **Essay & Writing Reviews** | **10Hrs** |
| Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- SoP | | |
| **Unit -IV** | **Public Speaking** | **10Hrs** |
| Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events | | |
| **Unit -V** | **Public Speaking and Non-Verbal Delivery** | **9Hrs** |
| Body Language – Facial Expressions-Kinesics – Oculesics – Proxemics – Haptics – Chronomics - Paralanguage – Signs | | |

**Textbooks:**

1. Critical Thinking, Academic Writing and Presentation Skills: MG University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)
2. Pease, Allan & Barbara. The Definitive Book of Body LanguageRHUS Publishers, 2016

**Reference Books:**

1. Alice Savage, Masoud Shafiei Effective Academic Writing,2Ed.,2014 Oxford University Press.
2. Shalini Verma, Body Language, S Chand Publications 2011.
3. Sanjay Kumar and Pushpalata,Communication Skills 2E 2015, Oxford.
4. Sharon Gerson, Steven Gerson,Technical Communication Process and Product, Pearson, New Delhi, 2014
5. Elbow, Peter. Writing with Power. OUP USA, 1998

**Online Learning Resources:**

1. https://youtu.be/NNhTIT81nH8
2. phttps://www.youtube.com/watch?v=478ccrWKY-A
3. https://www.youtube.com/watch?v=nzGo5ZC1gMw
4. https://www.youtube.com/watch?v=Qve0ZBmJMh4
5. https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-ofdelivery/
6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
7. https://archive.nptel.ac.in/courses/109/107/109107172/#
8. https://archive.nptel.ac.in/courses/109/104/109104107/

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**B.Tech III Year II Semester**

**MACHINE LEARNING LAB**
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0534P | 0:0:3:0 | 1.5 | CIE: 30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

**This course will enable students to:**

- To learn about computing central tendency measures and Data pre processing techniques
- To learn about classification and regression algorithms
- To apply different clustering algorithms for a problem.

**Course Outcomes (CO):**

- Compute and interpret central tendency measures (mean, median, mode) and measures of dispersion (variance, standard deviation) to summarize and describe datasets.
- Apply data preprocessing techniques, including attribute selection, handling missing values, discretization, and elimination of outliers, to prepare datasets for analysis
- Apply unsupervised learning algorithms including K-Means, Fuzzy C-Means, and Expectation Maximization for clustering tasks, and assess their performance using appropriate metrics
- Demonstrate the application of linear and logistic regression algorithms for predictive modeling in regression and classification problems, respectively..
- Evaluate and compare the performance of various machine learning algorithms using appropriate metrics and techniques, and select the most suitable model for a given dataset and problem

**List of Experiments:**

1. Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.
2. Apply the following Pre-processing techniques for a given dataset.
   a. Attribute selection
   b. Handling Missing Values
   c. Discretization
   d. Elimination of Outliers
3. Apply KNN algorithm for classification and regression
4. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results
5. Demonstrate decision tree algorithm for a regression problem
6. Apply Random Forest algorithm for classification and regression
7. Demonstrate Naïve Bayes Classification algorithm.
8. Apply Support Vector algorithm for classification
9. Demonstrate simple linear regression algorithm for a regression problem
10. Apply Logistic regression algorithm for a classification problem
11. Demonstrate Multi-layer Perceptron algorithm for a classification problem
12. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.
13. Demonstrate the use of Fuzzy C-Means Clustering
14. Demonstrate the use of Expectation Maximization based clustering algorithm.

**Web References:**

1. **https://www.udemy.com/course/machinelearning/**

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## B.Tech III Year II Semester

| CRYPTOGRAPHY AND NETWORK SECURITY LAB (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0535P** | **0:0:3:0** | **1.5** | **CIE: 30 SEE:70** | **3 Hours** | **PC** |

**Course Objectives:**

**This course will enable students to:**

- Explain the objectives of information security.
- Explain the importance and application of confidentiality, integrity, authentication and availability.
- Understand various cryptographic algorithms.
- Understand Buffer OverFlow attacks, Intrusion Detection Systems and Honeypots.
- Understand basic cryptographic algorithms, message and web authentication and security issues.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Demonstrate understanding of bitwise operations for basic encryption techniques by manipulating characters at the binary level.
- Implement classical encryption algorithms such as Caesar cipher, Substitution cipher, and Hill cipher to understand foundational cryptographic techniques.
- Develop and simulate modern symmetric encryption algorithms including DES, Blowfish, and Rijndael (AES) for secure data transmission.
- Apply asymmetric encryption algorithms like RSA and implement key exchange mechanisms such as Diffie-Hellman.
- Generate message digests using hashing algorithms like SHA-1 and MD5, and demonstrate the use of Java Cryptography Architecture (JCA) for implementing secure encryption and key management.

**List of Experiments**:

1. Write a C program that contains a string (char pointer) with a value _Hello world‘. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value _Hello world‘. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
 a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text ―Hello world‖ using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

**Web References:**

1. **https://cse29-iiith.vlabs.ac.in/List%20of%20experiments.html**

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## B.Tech III Year II Semester

### Soft Skills
(Common to All Branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0026T | 0: 1:2:0 | 2 | CIE:30 SEE:70 | 3 Hours | SE |

**Course Objectives:**

This course will enable students:
- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To enhance healthy relationship and understanding within and outside an organization
- To function effectively with heterogeneous teams

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**
- List out various elements of soft skills
- Describe methods for building professional image
- Apply critical thinking skills in problem solving
- Analyse the needs of an individual and team for well-being
- Assess the situation and take necessary decisions
- Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Soft Skills & Communication Skills** | **10 Hrs** |

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills Significance, process, types - Barriers of communication - Improving techniques

**Activities:**

**Intrapersonal Skills-** Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity (The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

**Interpersonal Skills-** Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

**Verbal Communication-** Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

**Non-verbal communication –** Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

| **Unit-II** | **Critical Thinking** | **9 Hrs** |
|---|---|---|

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection

**Activities:**

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues placing the problem – finding the root cause - seeking viable solution – judging with rationale evaluating the views of others - Case Study, Story Analysis

| **Unit-III** | **Problem Solving & Decision Making** | **9 Hrs** |
|---|---|---|

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles

**Activities:**
Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion

| **Unit-IV** | **Emotional Intelligence & Stress Management** | **10 Hrs** |
|---|---|---|

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self Regulation – Stress factors – Controlling Stress – Tips

**Activities:**
Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

| **Unit-V** | **Corporate Etiquette** | **10 Hrs** |
|---|---|---|

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips Overcoming challenges

**Activities**
Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

**NOTE-:**
1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

**Text Books:**

1. “ Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, KI esuoH,, gnihsilbuP lanoitanretnI 2018

**Reference Books:**

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018.
2. Alex K,Soft SkillsS.Chand& Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan& Sangeetha Sharma,Soft Skills: An Integrated Approach to Maximise PersonalityPublished by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Dr. Rajiv Kumar Jain, Dr. Usha Jain,Life Skills(Paperback English)Publisher : Vayu Education of India, 2014

**Web References:**

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

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**B.Tech III Year II Semester**

| **Technical Report Writing & IPR** (Common to All Branches) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0053T** | **2:0:0:0** | **-** | **-** | **-** | **MC** |

**Course Objectives:**

This course will enable students to:

- To enable the students to practice the basic skills of research paper writing
- To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
- To practice the basic skills of performing quality literature review
- To help them in knowing the significance of real life practice and procedure of Patents.
- To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

**Course Outcomes:**

**On completion of this course, student will be able to**

- Identify key secondary literature related to their proposed technical paper writing
- Explain various principles and styles in technical writing
- Use the acquired knowledge in writing a research/technical paper
- Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc
- Evaluate different forms of IPR available at national & international level
- Develop skill of making search of various forms of IPR by using modern tools and techniques.

| **Syllabus** | | **Total Hours:** |
|---|---|---|
| **Unit-I** | | **10 Hrs** |

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence andlogical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings discussing your limitations -hedging and criticizing -plagiarism and paraphrasing .

| **Unit-II** | | **10 Hrs** |
|---|---|---|

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis

| **Unit-III** | | **10 Hrs** |
|---|---|---|

Process of research: publication mechanism: types of journals- indexing-seminars- conferences- proof reading –plagiarism style; seminar & conference paper writing; Methodology-discussion-results-citation rules

| **Unit-IV** | | **9 Hrs** |
|---|---|---|

Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

| **Unit-V** | | **9 Hrs** |
|---|---|---|

Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.

**Text Books:**

1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013
2. Meenakshi Raman, Sangeeta Sharma. Technical Communication: Principles and practices. Oxford.

**Reference Books:**

1. R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli,Intellectual Property Rights Tata Mcgraw Hill, 2001
3. P.Naryan,Intellectual Property Law, 3rd Ed ,Eastern Law House, 2007.
4. Adrian Wallwork. English for Writing Research Papers Second Edition. Springer Cham Heidelberg New York ,2016
5. Dan Jones, Sam Dragga, Technical Writing Style

**Web References:**

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**IV Year I Semester (Theory-6, SEC-1, MC-1, PR-1)**

| Sl. No. | Category | Course Code | Course Title | Hours per week L | T | P | Credits C |
|---|---|---|---|---|---|---|---|
| 1 | PC | 23A0537T | Deep Learning | 2 | 1 | 0 | 3 |
| 2 | HS | 23A0049T<br>23A0050T<br>23A0048T | **Management Course- II**<br>1. Business Ethics and Corporate Governance<br>2. E-Business<br>3. Management Science | 2 | 0 | 0 | 2 |
| 3 | PE | 23A0538Ta<br>23A0538Tb<br>23A0538Tc<br>23A0450T | **Professional Elective-IV**<br>1. Software Architecture & Design Patterns<br>2. Blockchain Technology<br>3. Augmented Reality & Virtual Reality<br>4. Internet of Things | 3 | 0 | 0 | 3 |
| 4 | PE | 23A0539Ta<br>23A0539Tb<br>23A0539Tc<br>23A0539Td | **Professional Elective-V**<br>1. Agile methodologies<br>2. Metaverse<br>3. Computer Vision<br>4. Cyber Physical Systems | 3 | 0 | 0 | 3 |
| 5 | OE | | **Open Elective-III** | 3 | 0 | 0 | 3 |
| 6 | OE | | **Open Elective-IV** | 3 | 0 | 0 | 3 |
| 7 | SE | 23A0540P | **Skill Enhancement Course**<br>Prompt Engineering | 0 | 1 | 2 | 2 |
| 8 | MC | 23A0054T | **Audit Course**<br>Gender Sensitization | 2 | 0 | 0 | - |
| 9 | PR | 23A0541 | Evaluation of Industry Internship | - | - | - | 2 |
| **Total** | | | | **18** | **2** | **02** | **21** |

| **Category** | **Credits** |
|---|---|
| Professional Core Courses(PC) | 3 |
| Professional Elective Courses(PE) | 6 |
| Humanities and Social Science Course(HS) | 2 |
| Open Elective Courses(OE) | 6 |
| Skill Enhancement Course(SE) | 2 |
| Mandatory Course(MC) | - |
| Industry Internship(PR) | 2 |
| Total | 21 |

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## Open Elective – III

| Sl. No. | Course Code | Course Title | Offered by the Dept |
|---|---|---|---|
| 1 | 23A0152T | Building Materials and Services | CIVIL |
| 2 | 23A0153T | Environmental Impact Assessment | CIVIL |
| 3 | 23A0241T | Smart Grid Technologies | EEE |
| 4 | 23A0335T | 3D Printing Technologies | ME |
| 5 | 23A0416T | Microprocessors and Microcontrollers | ECE |
| 6 | 23A0031T | Wavelet transforms and its Applications | Mathematics |
| 7 | 23A0036T | Smart Materials And Devices | Physics |
| 8 | 23A0037T | Introduction to Quantum Mechanics | Physics |
| 9 | 23A0042T | Green Chemistry And Catalysis For Sustainable Environment | Chemistry |
| 10 | 23A0046T | Employability Skills | Humanities |

## Open Elective – IV

| Sl. No. | Course Code | Course Title | Offered by the Dept |
|---|---|---|---|
| 1 | 23A0154T | Geo-Spatial Technologies | CIVIL |
| 2 | 23A0155T | Solid Waste Management | CIVIL |
| 3 | 23A0242T | Electric Vehicles | EEE |
| 4 | 23A0334Td | Total Quality Management | ME |
| 5 | 23A0444T | Transducers and Sensors | ECE |
| 6 | 23A3315a | Introduction to Quantum Computing | CSE & Allied |
| 7 | 23A0032T | Financial Mathematics | Mathematics |
| 8 | 23A0038T | Sensors And Actuators For Engineering Applications | Physics |
| 9 | 23A0043T | Chemistry Of Nano materials and Applications | Chemistry |
| 10 | 23A0047T | Literary Vibes | Humanities |

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**B.Tech IV Year I Semester**

**DEEP LEARNING**
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0537T | 2: 1:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | PC |

**Course Objectives:**

This course will enable students:

- Demonstrate the major technology trends driving Deep Learning
- Build, train, and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyse the key parameters and hyper parameters in a neural network's architecture

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Demonstrate the mathematical foundation of neural network
- Describe the machine learning basics
- Differentiate architecture of deep neural network
- Build a convolutional neural network
- Build and train RNN and LSTMs

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Linear Algebra** | **8Hrs** |

Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis. Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes‘ Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

| | | |
|---|---|---|
| **Unit-II** | **Machine Learning** | **9Hrs** |

Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feed forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

| | | |
|---|---|---|
| **Unit-III** | **Regularization for Deep Learning** | **8Hrs** |

Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

| Unit-IV | Convolutional Networks | 9Hrs |
|---|---|---|
| The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks. | | |
| **Unit-V** | **Sequence Modeling** | **10Hrs** |
| Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models. | | |

**Text Books:**

1. Ian Good fellow, Yoshua Bengio, Aaron Courville, ―Deep Learning‖, MIT Press,2016.
2. Josh Patterson and Adam Gibson, ―Deep learning: A practitioner's approach‖, O'Reilly Media, First Edition,2017.

**Reference Books:**

1. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O‘Reilly, Shroff Publishers,2019.
2. Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O‘Reilly, Shroff Publishers,2019.

**Web References:**

1. https://keras.io/datasets/
2. http://deeplearning.net/tutorial/deeplearning.pdf
3. https://arxiv.org/pdf/1404.7828v4.pdf
4. https://www.cse.iitm.ac.in/~miteshk/CS7015.html
5. https://www.deeplearningbook.org
6. https://nptel.ac.in/courses/106105215

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## B.Tech IV Year I Semester

| Business Ethics and Corporate Governance (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0049T** | **2: 0:0:0** | **2** | **CIE:30 SEE:70** | **3 Hours** | **HS** |

**Course Objectives:**

This course will enable students:

- To make the student understand the principles of business ethics
- To enable them in knowing about the ethics in management
- To facilitate the student‘ role in corporate culture
- To impart knowledge about the fair-trade practices
- To encourage the student in knowing about the corporate governance

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Understand the Ethics and different types of Ethics.
- Understand business ethics and ethical practices in management
- Understand the role of ethics in management
- Apply the knowledge of professional ethics & technical ethics
- Analyze corporate law, ethics, codes & principles
- Evaluate corporate governance & corporate scams

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Ethics** | **10Hrs** |

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior.. Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management -Corporate Social Responsibility – Issues of Management – Crisis Management.

| **Unit-II** | **ETHICS IN MANAGEMENT** | **9Hrs** |
|---|---|---|

Introduction- Ethics in production, finance, Human resource management and Marketing Management - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics –Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.

| **Unit-III** | **CORPORATE CULTURE** | **10Hrs** |
|---|---|---|

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

| **Unit-IV** | **LEGAL FRAME WORK** | **9Hrs** |
|---|---|---|

Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

| Unit-V | CORPORATE GOVERNANCE | 10Hrs |
|---|---|---|

Introduction - Meaning – Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams - Committees in India and abroad, corporate social responsibility. BoDs composition, Cadbury Committee - Various committees - Reports - Benefits and Limitations.

**Text Books:**

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017
2. .Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

**Reference Books:**

1. Dr. K. Nirmala, KarunakaraReaddy. *Business Ethics and Corporate Governance*, HPH
2. H.R.Machiraju: *Corporate Governance*, HPH, 2013
3. K. Venkataramana, *Corporate Governance*, SHBP.
4. N.M.Khandelwal. *Indian Ethos and Values for Managers*

**Web References:**

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. https://archive.nptel.ac.in/courses/110/105/110105138/
3. https://onlinecourses.nptel.ac.in/noc21_mg54/
4. https://onlinecourses.nptel.ac.in/noc22_mg54/
5. https://archive.nptel.ac.in/courses/109/106/109106117/

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## B.Tech IV Year I Semester

| E-Business<br>(Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0050T** | **2: 0:0:0** | **2** | **CIE:30 SEE:70** | **3 Hours** | **HS** |

**Course Objectives:**

This course will enable students:

- To provide knowledge on emerging concept on E-Business related aspect.
- To understand various electronic markets & business models.
- To impart the information about electronic payment systems & banking.
- To create awareness on security risks and challenges in E-commerce.
- To the students aware on different e-marketing channels & strategies.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Remember E-Business & its nature, scope and functions.
- Understand E-market-Models which are practicing by the organizations
- Apply the concepts of E-Commerce in the present globalized world.
- Analyze the various E-payment systems & importance of net banking.
- Evaluate market research strategies & E-advertisements.
- Understand importance of E-security & control

| | **Syllabus** | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Electronic Business** | **10Hrs** |

Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E-Commerce – E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries..

| **Unit-II** | **Electronic Markets and Business Models** | **9Hrs** |
|---|---|---|

Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India

| **Unit-III** | **Electronic Payment Systems** | **10Hrs** |
|---|---|---|

Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e-wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage -Electronic Fund Transfer (EFT): Role in business transactions -Infrastructure requirements and regulatory aspects of e-payments

| **Unit-IV** | **E-Security** | **9Hrs** |
|---|---|---|

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing e-business platforms.

| Unit-V | E-Marketing | 10Hrs |
|---|---|---|
| Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM) | | |

**Text Books:**

1. Arati Oturkar & Sunil Khilari. E-Business. Everest Publishing House, 2022
2. P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011.

**Reference Books:**

1. Debjani, Kamalesh K Bajaj. E-Commerce, Second Edition Tata McGraw-Hill‘s, 2005
2. Dave Chaffey.E-Commerce E-Management, Second Edition, Pearson, 2012.
3. Henry Chan. E-Commerce Fundamentals and Application, RaymondLeathamWiley India 2007
4. S. Jaiswal. E-Commerce GalgotiaPublication Pvt Ltd., 2003

**Web References:**

1. https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771
2. https://www.slideshare.net/VikramNani/e-commerce-business-models
3. https://www.slideshare.net/RiteshGoyal/electronic-payment-system
4. https://www.slideshare.net/WelingkarDLP/electronic-security
5. https://www.slideshare.net/Ankitha2404/emarketing-ppt

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## B.Tech IV Year I Semester

| MANAGEMENT SCIENCE (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0048T** | **2: 0:0:0** | **2** | **CIE:30 SEE:70** | **3 Hours** | **HS** |

**Course Objectives:**

This course will enable students:

- To provide fundamental knowledge on Management, Administration, Organization & its concepts
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection,
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in modern management

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Remember the concepts & principles of management and designs of organization in a practical world
- Understand the knowledge of Work-study principles & Quality Control techniques in industry
- Apply the process of Recruitment & Selection in organization
- Analyze the concepts of HRM & different training methods.
- Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
- Create awareness on contemporary issues in modern management & technology

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Introduction to Management** | **10 Hrs** |

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor‘s Scientific Theory-Henry Fayol‘s principles - Elton Mayo‘s Human relations - **Organizational Designs** - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

| **Unit-II** | **Operations Management** | **10 Hrs** |
|---|---|---|

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- **Material Management -** Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - **Marketing Management -** Concept - Meaning - Nature- Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

| **Unit-III** | **Human Resources Management (HRM)** | **10 Hrs** |
|---|---|---|

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning (HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process - Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

| **Unit-IV** | **Strategic & Project Management** | **9 Hrs** |
|---|---|---|
| Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis | | |
| **Project Management -** Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems). | | |
| **Unit-V** | **Contemporary Issues in Management** | **9 Hrs** |
| Customer Relations Management (CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management (SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge Management – change management –sustainability and corporate social responsibility | | |

**Text Books:**

1. Frederick S. Hillier, Mark S. Hillier. *Introduction to Management Science*, October 26, 2023
2. A.R Aryasri, *Management Science*, TMH, 2019

**Reference Books:**

1. Stoner, Freeman, Gilbert.*Management* Pearson Education, New Delhi, 2019.
2. Koontz & Weihrich, *Essentials of Management*, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich, *Management Principles and Guidelines*, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C.Certo, *Modern Management*, 9/e, PHI, 2005

**Web References:**

1. https://www.slideshare.net/slideshow/introduction-to-management-and-organization- 231308043/231308043
2. https://nptel.ac.in/courses/112107238
3. https://archive.nptel.ac.in/courses/110/104/110104068/
4. https://archive.nptel.ac.in/courses/110/105/110105069/
5. https://onlinecourses.nptel.ac.in/noc24_mg112/

**B.Tech IV Year I Semester**

| SOFTWARE ARCHITECTURE AND DESIGN PATTERNS<br>(Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0538Ta** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **PE** |

**Course Objectives:**

After completing this course, the student should be able to:

- To understand the concept of patterns and the Catalog.
- To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation and consistency.
- To understand the variety of implemented bad practices related to the Business and Integration tiers.

**Course Outcomes (CO):**

After completion of the course, students will be able to:

- To highlight the evolution of patterns.
- To learn how to add functionality to designs while minimizing complexity
- To learn what design patterns really are, and are not
- To know about specific design patterns.
- To learn how to use design patterns to keep code quality high without over design.

**Syllabus**

| **Unit-I** | | **10 Hrs** |
|---|---|---|

Envisioning Architecture: The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. Creating an Architecture: Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture

| **Unit-II** | | **10 Hrs** |
|---|---|---|

Analyzing Architectures: Architecture Evaluation, Architecture design decision making, ATAM, CBAM. Moving from one system to many: Software Product Lines, Building systems from off the shelf components, Software architecture in future

| **Unit-III** | | **10 Hrs** |
|---|---|---|

Patterns: Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage. Creational and Structural patterns: Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.

| **Unit-IV** | | **9 Hrs** |
|---|---|---|

Behavioural patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy. template method, visitor.

| **Unit-V** | | **9 Hrs** |
|---|---|---|

Case Studies: A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development

**Textbooks:**

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education

**Reference Books:**

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006 6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
6. Design Patterns in C#, Steven John metsker, Pearson education, 2004.
7. Pattern Oriented Software Architecture, F.Buschmann &others, John Wiley & Sons.

**Web References:**

1. **https://nptel.ac.in/courses/106105224**

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3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
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**B.Tech IV Year I Semester**

## BLOCK CHAIN TECHNOLOGY
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0538Tb | 3: 0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | PE |

**Course Objectives:**

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them.
- Design, build, and deploy smart contracts and distributed applications.
- Integrate ideas from block chain technology into their own projects.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
- Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
- Examine how to profit from trading crypto currencies

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction** | **8Hrs** |

Introduction, Scenarios, Challenges Articulated, Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain. Evolution of Block chain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Block chain Environments, Type of Players in Block chain Ecosystem, Players in Market.

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|---|---|---|
| **Unit-II** | **Block chain Concepts** | **9Hrs** |

Block chain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with bloc chain solutions, life cycle of block chain transaction.

| | | |
|---|---|---|
| **Unit-III** | **Architecting Block chain solutions** | **8Hrs** |

Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications.

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|---|---|---|
| **Unit-IV** | **Ethereum Block chain Implementation** | **9Hrs** |

Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Ether scan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppel in Contracts .

| Unit-V | Hyper ledger Block chain Implementation | 8Hrs |
|---|---|---|

Hyper ledger Implementation: Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyper ledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chain code Functions Using Client Application.
Advanced Concepts in Block chain: Introduction, Inter Planetary File System (IPFS), Zero Knowledge Proofs, Oracles, Self-Sovereign Identity, Block chain with IoT and AI/ML Quantum Computing and Block chain, Initial Coin Offering, Block chain Cloud Offerings, Block chain and its Future Potential.

**Text Books:**

1. Ambadas, Arshad Sarfarz Ariff, Sham ―Block chain for Enterprise Application Developers‖, Wiley,2020
2. Andreas M. Antonopoulos, ―Mastering Bitcoin: Programming the Open Blockchain‖, O'Reilly, 2017

**Reference Books:**

1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

**Web References**

1. https://github.com/blockchainedindia/resources

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**B.Tech IV Year I Semester**

| AUGMENTED REALITY AND VIRTUAL REALITY (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0538Tc** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **PE** |

**Course Objectives:**

The primary objective of this course is to introduce students to:

- The foundational principles and technologies of Virtual Reality (VR) and Augmented Reality (AR), along with the key devices, modeling techniques, and interaction mechanisms involved in creating immersive environments.
- The course will cover the essentials of VR and AR, including hardware, software, and human perception, as well as advanced concepts such as 3D modeling, interaction design, and audio rendering.
- Students will gain hands-on experience in the use of VR/AR systems and explore the challenges and methodologies for building interactive virtual environments.

**Course Outcomes (CO):**

**At the end of the Course the student will be able to:**

- Understand the core concepts of Virtual Reality and Augmented Reality, and their differences.
- Learn about the hardware and software components required for VR and AR systems, as well as the impact of human physiology and perception on the virtual experience.
- Gain knowledge of input devices (trackers, navigation, and gesture interfaces) and output devices (graphics, sound displays, and haptic feedback).
- Develop skills in modeling techniques, including geometric, kinematics, physical, and behavior modeling for VR and AR environments.
- Explore the technologies and methodologies used to create Augmented Reality systems, including marker-based AR and AR software development.

| | **Syllabus** | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **INTRODUCTION TO VIRTUAL REALITY (VR)** | **10Hrs** |

Defining Virtual Reality, Key elements of virtual reality experience, Virtual Reality, Telepresence, Augmented Reality and Cyberspace.

**Bird's-Eye View:** Hardware, Software, Human Physiology and Perception.

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| **Unit-II** | **Input Devices & Output Devices** | **10Hrs** |

**Input Devices: (Trackers, Navigation, and Gesture Interfaces):** Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces.

**Output Devices:** Graphics displays, sound displays & haptic feedback.

| | | |
|---|---|---|
| **Unit-III** | **Modeling** | of Industry Internship |

Modeling: Geometric modeling, Kinematics modeling, Physical modeling, Behaviour modeling, Model management.

| Unit-IV | AR Vs VR | 10Hrs |
|---|---|---|
| **Augmented Reality (AR):** Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating AR systems<br>**AR software development :** AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit. | | |
| **Unit-V** | **Interaction & Audio** | **9Hrs** |
| Interaction - Motor Programs and Remapping, Locomotion, Manipulation, Social Interaction. Audio -The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering. Interaction - Motor Programs and Remapping, Locomotion, Manipulation, Social Interaction. Audio -The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering. (from Text Book2) | | |

**Text Books:**

1. Virtual Reality Technology, Second Edition, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons, Inc, 2017.
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.

**References:**

1. Rajesh K. Maurya, *Computer Graphics with Virtual Reality System*, 3rd Edition, Wiley Publication, 2018.
2. William R. Sherman and Alan B. Craig, *Understanding Virtual Reality Interface, Application, and Design*, 2nd Edition, Morgan Kaufmann Publishers, Elsevier, 2019.
3. Grigore C.Burdea, Philippe Coiffet,*Virtual Reality Technology*, 2nd Edition, Wiley,2017.
4. K.S. Hale and K. M. Stanney, *Handbook on Virtual Environments*, 2nd Edition, CRC Press, 2015.

**Web References:**

1. http://vr.cs.uiuc.edu/vrbook.pdf
2. https://nptel.ac.in/courses/106/106/106106138/

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**B.Tech IV Year I Semester**

**INTERNET OF THINGS**
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0450T | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | PE |

**Course Objectives:**

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology
- Introduce some of the application areas where IoT can be applied.
- Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Understand general concepts of Internet of Things.
- Apply design concept to IoT solutions
- Analyze various M2M and IoT architectures
- Evaluate design issues in IoT applications
- Create IoT solutions using sensors, actuators and Devices

**Syllabus**

| | | |
|---|---|---|
| **Unit-I** | **Introduction to IoT** | **10 Hrs** |

Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates.

| | | |
|---|---|---|
| **Unit-II** | **Prototyping IoT Objects using Microprocessor/Microcontroller** | **9 Hrs** |

Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

| | | |
|---|---|---|
| **Unit-III** | **IoT Architecture and Protocols** | **9 Hrs** |

Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

| | | |
|---|---|---|
| **Unit-IV** | **Device Discovery and Cloud Services for IoT** | **10 Hrs** |

Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

| | | |
|---|---|---|
| **Unit-V** | **UAV IoT** | **10 Hrs** |

Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

**Textbooks:**

1. Vijay Madisetti and Arshdeep Bahga, ― Internet of Things ( A Hands-on-Approach)‖, 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

**Reference Books:**

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, ―Rethinking the Internet of Things: A Scalable Approach to Connecting Everything‖, 1st Edition, Apress Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 9781-4493- 9357-
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

**Web Resources:**

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

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**B.Tech IV Year I Semester**

## AGILE METHODOLOGIES
(Common to CSE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0539Ta | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PE |

**Course Objectives:**

- To provide students with a theoretical as well as practical under standing of agile software development practices and how small teams can apply them to create high-quality software.
- To provide good understanding of software design and set of software technologies and APIs.
- To carry out detailed examination and demonstration of Agile development and testing techniques.
- To discuss Agile software development

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.
- Develop techniques and tools for improving team collaboration and software quality.
- Perform Software process improvement as an ongoing task for development teams.
- Show how agile approaches can be scaled up to the enterprise level.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **AGILE METHODOLOGY** | **9Hrs** |

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

| | | |
|---|---|---|
| **Unit-II** | **AGILE PROCESSES** | **8Hrs** |

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

| | | |
|---|---|---|
| **Unit-III** | **AGILITY AND KNOWLEDGE MANAGEMENT** | **8Hrs** |

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

| | | |
|---|---|---|
| **Unit-IV** | **AGILITY AND REQUIREMENTS ENGINEERING** | **9Hrs** |

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation..

| Unit-V | AGILITY AND QUALITY ASSURANCE | 9Hrs |
|---|---|---|
| Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development. | | |

**Text Books:**

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009..

**Reference Books:**

1. Craig Larman, ―Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.
2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007

**Web References:**

1. https://www.nptelvideos.com/video.php?id=904

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**B.Tech IV Year I Semester**

**METAVERSE**
(Common to CSE, AI&ML, DS, CS)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0539Tb | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PE |

**Course Objectives:**

The main objectives of the course are to:

- Present and discuss Metaverse characteristics, concepts and layers.
- Explain and analyse Metaverse technologies, tools, platforms, and applications.
- Discuss design theories and practices relevant to the Metaverse.
- Explore cyber security and cybercrime in the Metaverse.
- Examine open challenges in the Metaverse.

**Course Outcomes (CO):**

**After completion of the course students are expected to be able to:**

- Understand the characteristics, and interdisciplinary nature of the Metaverse, the opportunities and risks it presents.
- Analyze Metaverse layers, the technologies used in creating them, as well as design theories and practices for Metaverse.
- Examine and discuss Metaverse platforms, applications and the latest technological developments in this area.
- Identify cyber security issues, understand cybercrime, and discuss the open challenges.
- Building Metaverse Applications

| | Syllabus | Total Hours: |
|---|---|---|
| Unit-I | Metaverse fundamentals | 10 Hrs |

**Metaverse fundamentals:**
Metaverse evolution, Metaverse importance and characteristics, the interdisciplinary nature of the Metaverse, Metaverse opportunities and risks, Computer-mediated communication (social presence theory, social information processing theory, media richness theory, cyborg theory), Avatar-mediated communication.

| Unit-II | The seven layers of Metaverse | 10 Hrs |
|---|---|---|

**The seven layers of Metaverse:** Experience Discovery, Creator economy, Spatial computing, Decentralization, Human interface, Infrastructure

Metaverse Technologies part I: AR/VR/MR/XR, 3D reconstruction, Game engines, Smart glasses, wearables, haptic devices, headsets and headwear.

| Unit-III | Metaverse technologies part II: | 9 Hrs |
|---|---|---|

Metaverse technologies part II: Blockchain, smart contracts, tokens, NFTs, Cryptography, Artificial Intelligence (AI), Internet of Things (IoT), Edge computing and 5G, 6G.Design theories and practices: Social presence and co-presence, Motion sickness and cybersickness, Uncanny valley, Sense of self-location, sense of agency and sense of body ownership, Universal simulation principle, Prototyping, Evaluation techniques (qualitative and quantitative).

| Unit-IV | Tools and technologies for Metaverse UX and UI | 9 Hrs |
|---|---|---|

**Tools and technologies for Metaverse UX and UI**: Tools and services for avatar systems, Spatial user interface design, Cross-platform user experience design, Multimodal user interface, Technologies and devices for human computer interaction in Metaverse, Metaverse platforms: Decentraland, SANDBOX, Roblox, Axie Infinity, uHive, Hyper Nation, Nakamoto (NAKA), Metahero (HERO), Star Atlas (ATLAS), Bloktopia (BLOK), Stageverse, Spatial, PalkaCity, Viverse, Sorare, Illuvium, Upland, Second Life, Sansar, Sensorium Galaxy

| Unit-V | Metaverse applications | 10 Hrs |
|---|---|---|

**Metaverse applications - part I:** Gaming and entertainment, Travel and tourism, Education and learning, Remote working, Commerce and business, **Metaverse applications - part II:** Real estate, Banking and Finance, Healthcare, Social media, Fashion, Metaverse and cyber security: Cyber security concerns in Metaverse: Social engineering attacks, Data theft, Decentralization vs vulnerabilities, Cyber security risks in Metaverse: process, people, technology, Metaverse and cybercrime: Scam and theft, Rug pull, Money manipulation and wash trading, Money laundering, Metaverse challenges and open issues: Persistency, Interoperability and scalability, Maturity, Regulation, Usefulness and ease-of-use, Privacy and data security, Content creation, NFTs and creator economy, Social, legal and ethical issues in the Metaverse

**Text Books:**

1. The Metaverse, Terry Winters, Independently published, 2021, ISBN: 979-8450959283

**Reference Books:**


1. Ball, M., 2022, ―The Metaverse and How It Will Revolutionize Everything―, Liveright, ISBN: 978- 1324092032
2. Damar, M. (2021). Metaverse shape of your life for future: A bibliometric snapshot. Journal ofMetaverse, 1(1), 1–8.
3. Day, J. (2022) Metaverse will see cyber warfare attacks unlike anything before: 'Massively elevated', February 28. https://www.express.co.uk/news/science/1570844/metaverse-news-cyber- warfare-attacks-virtual-worlds-russia-china-spt.
4. Polyviou, A., Sharma K., Pappas, I.O.(2023). Training in the metaverse: Employing physiological data to improve how we build metaverses for businesses. The next generation internet: The role of metaverses, AR, VR, MR, and digital twins, Temple University Institute for Business and Information Technology Link: https://ibit.temple.edu/nextgenerationinternet
5. QuHarrison T. , Keeney, S., 2022, ―The Metaverse Handbook: Innovating for the Internet's NextTectonic Shift‖, Wiley, ISBN: 978-1119892526
6. The mistocleous, M., Christodoulou, K., & Katelaris, L. (2023). An Educational Metaverse Experiment: The first on-chain and in- Metaverse academic course. Information Systems. EMCIS2022. Lecture Notes in Business Information Processing, Springer, Cham.
7. Stephenson, N., 1992, ―Snow Crash‖, ISBN: 978-055338

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**B.Tech IV Year I Semester**

| **COMPUTER VISION**<br>(Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0539Tc** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **PE** |

**Course Objectives:**

After completing the course, you will be able to:
The objective of this course is to understand the basic issues in computer vision and major approaches to address the methods to learn the Linear Filters, segmentation by clustering, Edge detection, Texture.

**Course Outcomes (CO):**

After completing the course, you will be able to:

- Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
- Describe known principles of human visual system,
- Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition,
- Suggest a design of a computer vision system for a specific problem

| **Syllabus** | | **Total Hours:42** |
|---|---|---|
| **Unit-I** | **LINEAR FILTERS** | **8Hrs** |
| Introduction to Computer Vision, Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids. | | |
| **Unit-II** | **EDGE DETECTION** | **9Hrs** |
| Noise- Additive Stationary Gaussian Noise, Why Finite Differences Respond to Noise, Estimating Derivatives - Derivative of Gaussian Filters, Why Smoothing Helps, Choosing a Smoothing Filter, Why Smooth with a Gaussian? Detecting Edges-Using the Lap lacian to Detect Edges, Gradient-Based Edge Detectors, Technique: Orientation Representations and Corners. | | |
| **Unit-III** | **TEXTURE** | **9Hrs** |
| Representing Texture –Extracting Image Structure with Filter Banks, Representing Texture using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids –The Lap lacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids, Application: Synthesizing Textures for Rendering, Homogeneity, Synthesis by Sampling Local Models, Shape from Texture, Shape from Texture for Planes | | |
| **Unit-IV** | **SEGMENTATION BY CLUSTERING** | **8Hrs** |
| What is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction. Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering. The Hough Transform, Fitting Lines, Fitting Curves | | |
| **Unit-V** | **RECOGNIZATION BY RELATIONS BETWEEN TEMPLATES** | **8Hrs** |
| Finding Objects by Voting on Relations between Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to Prune Search, Hidden Markov Models, Application: HMM and Sign Language Understanding, Finding People with HMM. | | |

**Textbooks:**

1. David A. Forsyth, Jean Ponce, Computer Vision – A modern Approach, PHI, 2003.

**Reference Books:**

1. Geometric Computing with Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics, Springer;1 edition,2001by Sommer.
2. Digital Image Processing and Computer Vision,1/e, by Sonka.
3. Computer Vision and Applications: Concise Edition (With CD) by Jack Academy Press, 2000.

**Web Resources:**

1. https://nptel.ac.in/courses/106105216https://nptel.ac.in/courses/108103174

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**B.Tech IV Year I Semester**

| CYBER PHYSICAL SYSTEMS (Common to CSE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0539Td** | **3:0:0:0** | **3** | **CIE: 30 SEE:70** | **3 Hours** | **PE** |

**Course Objectives:**

The objective of this course is to provide students with a comprehensive understanding of the various techniques and methodologies used to design, secure, synchronize, and schedule operations within Cyber- Physical Systems (CPS). The course will cover symbolic synthesis for CPS, security aspects, distributed synchronization, real-time scheduling, and model integration, with an emphasis on both basic principles and advanced techniques.

**Course Outcomes (CO):**

At the end of the course the student will be able to:

- Understand the core principles behind CPS
- Identify Security mechanisms of Cyber physical systems
- Understand Synchronization in Distributed Cyber-Physical Systems
- To Understand the Scheduling for Cyber-Physical Systems
- To understand the various Cyber-Physical System models.

**Syllabus**

| Unit | | Hours |
|---|---|---|
| **Unit-I** | | **10 Hrs** |

Symbolic Synthesis for Cyber-Physical Systems Introduction and Motivation, Basic Techniques - Preliminaries, Problem Definition, Solving the Synthesis Problem, Construction of Symbolic Models, Advanced Techniques: Construction of Symbolic Models, Continuous-Time Controllers, Software Tools

| | | |
|---|---|---|
| **Unit-II** | | **9 Hrs** |

Security of Cyber-Physical Systems Introduction and Motivation, Basic Techniques - Cyber Security Requirements, Attack Model, Countermeasures, Advanced Techniques: System Theoretic Approaches

| | | |
|---|---|---|
| **Unit-III** | | **9 Hrs** |

Synchronization in Distributed Cyber-Physical Systems: Challenges in Cyber-Physical Systems, A Complexity-Reducing Technique for Synchronization, Formal Software Engineering, Distributed Consensus Algorithms, Synchronous Lockstep Executions, Time-Triggered Architecture, Related Technology, Advanced Techniques

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|---|---|---|
| **Unit-IV** | | **10 Hrs** |

Real-Time Scheduling for Cyber-Physical Systems Introduction and Motivation, Basic Techniques - Scheduling with Fixed Timing Parameters, Memory Effects, Multiprocessor/Multicore Scheduling, Accommodating Variability and Uncertainty

| | | |
|---|---|---|
| **Unit-V** | | **10 Hrs** |

Model Integration in Cyber-Physical Systems Introduction and Motivation, Causality, Semantic Domains for Time, Interaction Models for Computational Processes, Semantics of CPS DSMLs, Advanced Techniques, For Spec, The Syntax of CyPhyML, Formalization of Semantics, Formalization of Language Integration.

**Text Books**:
1. Raj Raj kumar, Dion is io De Niz, and Mark Klein, Cyber-Physical Systems, Addison Wesley Professional.
2. Rajeev Alur, Principles of Cyber-Physical Systems, MIT Press, 2015.

**Reference Books:**
1. André Platzer. Foundations of Cyber-Physical Systems. Lecture Notes, Computer Science Department, Carnegie Mellon University. 2013.

**Web Resources:**
1. https://onlinecourses.nptel.ac.in/noc23_cs62/preview

**B.Tech IV Year I Semester**

**BUILDING MATERIALS AND SERVICES**
**(CSE, AI&ML, CS, DS,ECE, EEE, ME)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0152T | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

**The objectives of the course are to make the students learn about**

- To understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
- To Analyse the composition, manufacturing process, and properties of cement and admixtures.
- To apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
- To evaluate masonry, mortars, finishing techniques, and formwork systems.
- To assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

**Course Outcomes(CO):**

**Upon completion of this course, students should be able to:**

- Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
- Analyse the composition, manufacturing process, and properties of cement and admixtures.
- Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
- Evaluate masonry, mortars, finishing techniques, and formwork systems.
- Assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

| Syllabus | | Total Hours:42 |
|---|---|---|
| **Unit-I** | **Stones and Bricks, Tiles** | **8Hrs** |

Building Stones – Classifications and Quarrying – Properties – Structural Requirements – Dressing. Bricks – Composition of Brick Earth – Manufacture and Structural Requirements, Fly Ash, Ceramics. Timber, Aluminum, Glass, Paints and Plastics: Wood - Structure – Types and Properties – Seasoning – Defects; Alternate Materials for Timber – GI / Fibre – Reinforced Glass Bricks, Steel & Aluminum, Plastics.

| | | |
|---|---|---|
| **Unit-II** | **Cement &Admixtures** | **9Hrs** |

Types of Cement - Ingredients of Cement – Manufacture – Chemical Composition – Hydration - Field & Lab Tests – Fineness – Consistency – Initial &Final Setting – Soundness. Admixtures – Mineral & Chemical Admixtures – Uses

| | | |
|---|---|---|
| **Unit-III** | **Building Components** | **9Hrs** |

Lintels, Arches, Walls, Vaults – Stair Cases – Types of Floors, Types of Roofs – Flat, Curved, Trussed; Foundations – Types; Damp Proof Course; Joinery – Doors – Windows – Materials – Types.

| | | |
|---|---|---|
| **Unit-IV** | **Mortars, Masonry and Finishing‘s Mortars** | **8Hrs** |

Lime and Cement Mortars Brick Masonry – Types – Bonds; Stone Masonry – Types; Composite Masonry – Brick-Stone Composite; Concrete, Reinforced Brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP. form Work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

| Unit-V | Building Services | 8Hrs |
|---|---|---|
| Plumbing Services: Water Distribution, Sanitary – Lines &Fittings; Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning - Essentials and Types; Acoustics – Characteristic – Absorption – Acoustic Design; Fire Protection – Fire Hazards – Classification of Fire Resistant Materials and Constructions. | | |

**Text Books:**

1. Building Materials and Construction, Arora & Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.

**Reference Books:**

1. Building Construction by B. C. Punmia, Ashok Kumar Jain andArun Kumar Jain – Laxmi Publications (P) ltd., New Delh
2. P. C. Varghese, Building Materials, Prentice Hall of India, 2015.
3. N.Subramanian, Building Materials Testing and Sustainability", Oxford Higher Education, 2019.
4. R. Chudley, Construction Technology, Longman Publishing Group, 1973.
5. S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

**Online Learning Resources:**

- https://archive.nptel.ac.in/courses/105/102/105102088/

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**B.Tech IV Year I Semester**

## ENVIRONMENTAL IMPACT ASSESSMENT
## (CSE, AI&ML, CS, DS, ECE, EEE, ME)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0121T | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

**The objectives of the course are to make the students learn about**

- Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
- Analyse the impact of developmental activities on land use, soil, and water resources.
- Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
- Develop environmental audit procedures and assess compliance with environmental regulations.
- Understand and apply environmental acts, notifications, and legal frame works in EIA studies.

**Course Outcomes(CO):**

**Upon completion of this course, students should be able to:**

- Apply various methodologies for conducting Environmental Impact Assessments.
- Analyse the impact of land-use changes on soil, water, and air quality.
- Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.
- Develop environmental audit reports and assess compliance with environmental policies.
- Interpret and apply environmental acts and regulations related to EIA.

| Syllabus | | Total Hours:42 |
|---|---|---|
| **Unit-I** | **Concepts and methodologies of EIA** | **8Hrs** |
| Initial Environmental Examination, Elements of EIA, - Factors Affecting E-I-A Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters-Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis. | | |
| **Unit-II** | **Impact of Developmental Activities and Land Use** | **9Hrs** |
| Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I Ain Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts On Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact. | | |
| **Unit-III** | **Assessment of Impact On Vegetation, Wildlife and Risk Assessment** | **9Hrs** |
| Introduction - Assessment of Impact of Development Activities On Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing An Environmental Risk Assessment-Advantages of Environmental Risk Assessment. | | |
| **Unit-IV** | **Environmental Audit** | **8Hrs** |
| Introduction - Environmental Audit &Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit Data and Preparation of Audit Report | | |

| Unit-V | Environmental Acts and Notifications | 8Hrs |
|---|---|---|
| The Environmental Protection Act, The Water Preservation Act, The Air (Prevention &Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, Concept of ISO and ISO 14000. | | |

**Text Books:**

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

**Reference Books:**

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania & Sons Publication, New Delhi
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

**Online Learning Resources:**

- https://archive.nptel.ac.in/courses/124/107/124107160/

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**B.Tech IV Year I Semester**

**SMART GRID TECHNOLOGIES**
**(Common to All Branches of Engineering Except EEE)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0241T | 3:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To understand the evolution of electric grids and the necessity of Smart Grids, by comparing conventional systems with modern smart grids, studying enabling technologies, international deployment experiences, and India's Smart Grid road map and architecture.
- To gain knowledge of Wide Area Monitoring Systems (WAMS) through the fundamentals of synchrophasor technology, structure and operation of PMUs and PDCs, applications in blackout analysis, and case studies on real-time system monitoring and control.
- To study the features, types, and functional specifications of Smart Meters, and to analyze AMR and AMI systems, their drivers, benefits, protocols, and applications in demand-side management such as peak load, outage, and power quality management.
- To acquire an understanding of information and communication technologies in Smart Grids, covering communication system requirements, modulation and demodulation techniques, and technologies like Radio, Mobile, Power Line, and Optical Fibre Communication along with smart grid protocols.
- To explore Smart Grid applications and integration of emerging energy technologies, such as renewable energy systems, distributed generation, protective relaying, home area networks, advanced energy storage technologies, and Plug-in Hybrid Electric Vehicles.
- To identify, assess, and address cybersecurity challenges in Smart Grids, focusing on risks in AMI, DG, automation, and EV management systems, while studying methodologies, security requirements, and Smart Grid Information Models for secure operations.

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Understanding the Concept and Evolution of Smart Grids.
- Analyzing Wide Area Monitoring System and Synchrophasor Technology.
- Applying Smart Metering and Advanced Metering Infrastructure (AMI) Concepts.
- Evaluating Information and Communication Technology (ICT) Systems in Smart Grids.
- Designing Smart Grid Applications and Cybersecurity Measures.

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Introduction to Smart Grid** | **10Hrs** |

Evolution of Electric Grid – Need for Smart Grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in Smart Grid deployment efforts – Smart Grid road map for India – Smart Grid Architecture

| | | |
|---|---|---|
| **Unit-II** | **Wide Area Monitoring System** | **9Hrs** |

Fundamentals of Synchro phasor Technology – concept and benefits of Wide Area Monitoring System – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road Map for Synchrophasor applications (NAPSI) – Operational experience and Blackout analysis using PMU - Case study on PMU.

| Unit -III | Smart Meters | 10Hrs |
|---|---|---|
| Features and functions of Smart Meters – Functional specification – category of Smart Meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand Side Integration: Peak load, Outage and Power Quality management. | | |
| **Unit -IV** | **Information and Communication Technology** | **10Hrs** |
| Overview of Smart Grid Communication system – Modulation and Demodulation Techniques: Radio Communication – Mobile Communication – Power Line Communication – Optical Fibre Communication – Communication Protocol for Smart Grid | | |
| **Unit -V** | **Smart Grid Applications and Cyber Security** | **9Hrs** |
| Applications : Overview and concept of Renewable Integration – Introduction to distributed generation - Role of Protective Relaying in Smart Grid – House Area Network – Advanced Energy Storage Technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug – in Hybrid electric Vehicles - Cyber Security: Security issues in DG, Distribution Automation, AMI, Electric Vehicle Management Systems – Approach to assessment of smart grid cyber security risks – Methodologies. Cyber Security requirements – Smart Grid Information Model. | | |

**Textbooks:**


1. James Momoh, "SMART GRID : Fundamentals of Design and Analysis", John Wiley and Sons, New York, 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons, New Jersey, 2012


**Reference Books:**


1. Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013. *B.Tech - CSE R23 Regulation* 149
2. Fereidoon.P.Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011.
3. Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.
4. Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.

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**B.Tech IV Year I Semester**

**3D PRINTING TECHNOLOGIES**
**(Common to All Branches of Engineering Except ME)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0335T | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to

- Understand the fundamental concepts of prototyping and distinguish between traditional and rapid prototyping methods.
- Demonstrate the working principles, materials, and applications of solid-, liquid-, and powder-based RP systems.
- Define the processes and classifications of rapid tooling and reverse engineering techniques.
- Identify common errors in 3D printing and evaluate pre-processing, processing, and post-processing issues.
- Familiarize RP-related software and its role in applications such as design, manufacturing, and medical fields.

**Course Outcomes (CO):**

On successful completion of the course, the student will be able to,

- Define and explain the evolution and need for rapid prototyping in modern product development.
- Compare and contrast various 3D printing technologies based on working principles, materials, and limitations.
- Apply knowledge of rapid tooling and reverse engineering techniques for industrial and design applications.
- Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions.
- Use RP-specific software tools to manipulate STL files and prepare models for printing in real-world scenarios.

**Syllabus**

| | | |
|---|---|---|
| **Module-I** | **Introduction to 3D Printing** | **10 Hrs** |

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

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|---|---|---|
| **Module-II** | **Solid and Liquid Based RP Systems** | **10 Hrs** |

Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

| | | |
|---|---|---|
| **Module-III** | **Powder Based & Other RP Systems** | **10 Hrs** |

Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM). Other RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

| **Module-IV** | **Rapid Tooling & Reverse Engineering** | **9 Hrs** |
|---|---|---|
| Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods. Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development | | |
| **Module-V** | **Errors in 3D Printing and Applications:** | **9 Hrs** |
| Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc. Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP. Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP. | | |

**Text Books:**

1. Chee Kai Chua and Kah Fai Leong, ―3D Printing and Additive Manufacturing Principles and Applications‖ 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, ―Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing‖, Springer, 2/e, 2010.

**Reference Books:**

1. Frank W.Liou, ―Rapid Prototyping & Engineering Applications‖, CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, ―Rapid Prototyping: Principles and Applications in Manufacturing‖, John Wiley&Sons, 2006.

**Web References:**

- NPTEL Course on Rapid Manufacturing.
- https://nptel.ac.in/courses/112/104/112104265/
- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/
- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-
- %20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP ilovepdfcompressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4 .

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**B.Tech IV Year I Semester**

**INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS**
**(Common To All Branches Except ECE)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0416T | 3:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:
- To learn the fundamental architectural concepts of microprocessors.
- To gain knowledge about assembly language programming concepts.
- To get familiar about 8086 interfacing.
- To understand the fundamentals of the 8051 Microcontroller.
- To learn interfacing with the 8051 Microcontroller.

**Course Outcomes(CO):**

After the completion of the course students will able to:
- Learn the fundamental architectural concepts of microprocessors.
- Gain knowledge about assembly language programming concepts.
- Understand the concepts of 8086 interfacing.
- Learn the fundamentals of the 8051 Microcontroller.
- Know the interfacing with the 8051 Microcontroller.
- Understand the concepts of interfacing 8051 Microcontroller.

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Microprocessor** | **10Hrs** |

**Microprocessor:** Introduction to Microprocessors**,** Main features of 8086 Microprocessor, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

| **Unit-II** | **8086 Programming** | **9Hrs** |
|---|---|---|

**8086 Programming:** Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

| **Unit -III** | **8086 Interfacing** | **10Hrs** |
|---|---|---|

**8086 Interfacing:** Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

| **Unit -IV** | **Microcontroller** | **10Hrs** |
|---|---|---|

**Microcontroller:** Introduction to RISC Processors, Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

| **Unit -V** | **Interfacing Microcontroller** | **9Hrs** |
|---|---|---|

**Interfacing Microcontroller:** Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor and Microcontroller.

**Textbooks:**

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

**Reference Books:**

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

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**B.Tech IV Year I Semester**

## WAVELET TRANSFORMS AND ITS APPLICATIONS
**(Common To All Branches)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0031T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:
- To introduce the fundamentals of wavelets, wavelet expansion, and transform techniques.
- To understand multiresolution analysis, scaling functions, and wavelet functions.
- To apply filter banks for analysis and synthesis in discrete wavelet transform.
- To analyze time-frequency characteristics and computational aspects of wavelet transforms.
- To study orthogonal, biorthogonal bases, frames, and their matrix representations.
- To develop problem-solving skills by applying wavelet methods to signal analysis and processing.

**Course Outcomes(CO):**

After the completion of the course students will able to:
- Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms
- Illustrate the multi resolution analysis ad scaling functions.
- Implement discrete wavelet transforms with multirate digital filters
- Understand multi resolution analysis and identify various wavelets and evaluate their time-frequency resolution properties.
- Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Wavelets** | **10Hrs** |
| Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets - effectiveness of Wavelet Analysis -The Discrete Wavelet Transform- The Discrete-Time and Continuous Wavelet Transforms. | | |
| **Unit-II** | **A Multiresolution Formulation of Wavelet Systems** | **9Hrs** |
| Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion. | | |
| **Unit -III** | **Filter Banks and the Discrete Wavelet Transform** | **10Hrs** |
| Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis – From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View. | | |
| **Unit -IV** | **Time-Frequency and Complexity** | **10Hrs** |
| Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms - The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform. | | |
| **Unit -V** | **Bases and Matrix Examples** | **9Hrs** |
| Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example – Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example. | | |

**Textbooks:**

1. C. Sidney Burrus, Ramesh A. Gopinath, “Introduction to Wavelets and Wavelets Transforms”, Prentice Hall, (1997).
2. James S. Walker, “A Primer on Wavelets and their Scientific Applications”, CRC Press, (1999)..

**Reference Books:**

1. RaghuveerRao, “Wavelet Transforms”, Pearson Education, Asia
2. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.

**Web Resources:**

1. http://users.rowan.edu/~polikar/WAVELETS/WTtutorial.html
2. http://www.wavelet.org/
3. http://www.math.hawaii.edu/~dave/Web/Amara's%20Wavelet%20Page.htm
4. https://jqichina.wordpress.com/wp-content/uploads/2012/02/ten-lectures-ofwaveletsefbc88e5b08fe6b3a2e58d81e8aeb2efbc891.pdf

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**B.Tech IV Year I Semester**

**SMART MATERIALS AND DEVICES**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0036T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To provide exposure to smart materials and their engineering applications.
- To impart knowledge on the basics and phenomenon behind the working of smart materials
- To explain the properties exhibited by smart materials
- To educate various techniques used to synthesize and characterize smart materials
- To identify the required smart material for distinct applications/devices

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Identify key discoveries that led to modern applications of shape memory materials, describe the two phases in shape memory alloys.
- Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties.
- Summarize various types of synthesis of smart materials.
- Analyze various characterization techniques used for smart materials.
- Interpret the importance of smart materials in various devices

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Introduction to Smart Materials** | **10Hrs** |
| Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magnetorheological materials, photoactive materials, Polymers and polymer composites (Basics). | | |
| **Unit-II** | **Properties of Smart Materials** | **9Hrs** |
| Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials. | | |
| **Unit -III** | **Synthesis of Smart Materials** | **10Hrs** |
| Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis. | | |
| **Unit -IV** | **Characterization Techniques** | **10Hrs** |
| Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM). | | |
| **Unit -V** | **Smart Materials based Devices** | **9Hrs** |
| Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices. | | |

**Textbooks:**

1. YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2017
2. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

**Reference Books:**

1. Gauenzi,P.,Smart Structures, Wiley, 2009.
2. MahmoodAliofkhazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014
3. Handbook of Smart Materials, Technologies, and Devices: Applications of Industry,4.0,Chaudhery MustansarHussain, Paolo Di Sia, Springer,2022.
4. Fundamentals of Smart Materials,Mohsen Shahinpoor, Royal Society of Chemistry, 2020

**Web Resources:**

1. **NPTEL course link: https://onlinecourses.nptel.ac.in/noc22_me17/preview**

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**B.Tech IV Year I Semester**

**INTRODUCTION TO QUANTUM MECHANICS**
**(Common To All Branches)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0037T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To understand the fundamental differences between classical and quantum mechanics.
- To study wave-particle duality, uncertainty principle, and their implications.
- To learn and apply Schrödinger equations to basic quantum systems.
- To use operator formalism and mathematical tools in quantum mechanics.
- To explore angular momentum, spin and their quantum mechanical representations.

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Explain the key principles of quantum mechanics and wave-particle duality.
- Apply Schrödinger equations to solve one-dimensional quantum problems.
- Solve quantum mechanical problems using operator and matrix methods.
- Evaluate quantum states using Dirac notation and expectation values.
- Analyze angular momentum and spin systems using Pauli matrices and operators.

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Principles of Quantum Mechanics** | **10Hrs** |

Introduction: Limitations of classical Mechanics, Difficulties with classical theories of black body radiation and origin of quantum theory of radiation.Wave-particle duality: de Broglie wavelength, Heisenberg uncertainty principle.Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states, Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions

| | | |
|---|---|---|
| **Unit-II** | **One Dimensional Problems and Solutions** | **9Hrs** |

Potential step – Reflection and Transmission at the interface. Potential well: Square well potential with rigid walls, Square well potential with finite walls. Potential barrier: Penetration of a potential barrier (tunneling effect). Periodic potential and Harmonic oscillator, Energy eigen functions and eigen values.

| | | |
|---|---|---|
| **Unit -III** | **Operator Formalism** | **10Hrs** |

Operators, Operator Algebra, Eigen values and Eigen vectors, Postulates of quantum mechanics, Matrix representation of wave functions and linear operators.

| | | |
|---|---|---|
| **Unit -IV** | **Mathematical Tools for Quantum Mechanics** | **10Hrs** |

The concept of row and column matrices, Matrix algebra,Hermitian operators – definition. Dirac‘s bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

| | | |
|---|---|---|
| **Unit -V** | **Angular Momentum and Spin** | **9Hrs** |

Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half(1/2), Spin angular momentum, Pauli‘s spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values.

**Textbooks:**

1. Quantum Mechanics. Vol 1, A. MessaiaNoth-Holland Pub. Co., Amsterdam,(1961).
2. A Text Book of Quantum Mechanics. P.M.Mathews and K.Venkatesam, Tata McGraw Hill, New Delhi,(1976).
3. Introduction to Quantum Mechanics. R.H.Dicke and J.P.Witke, Addison-Wisley Pub.Co.Inc.,London, (1960).
4. Quantum Mechanics. S.L.Gupta, V.Kumar, H.V.Sarama and R.C.Sharma, Jai PrakashNath& Co, Meerut, (1996).

**Reference Books:**

1. Quantum Mechanics. L.I. Schiff, McGraw Hill Book Co., Tokyo, (1968).
2. Introduction to Quantum Mechanics. Richard L. Liboff, Pearson Education Ltd (Fourth Edn.) 2003.

**Web Resources:**

1. https://archive.nptel.ac.in/courses/115/101/115101107/
2. https://archive.nptel.ac.in/courses/122/106/122106034/
3. https://nptel.ac.in/courses/115106066

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**B.Tech IV Year I Semester**

**GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT**
**(Common To All Branches)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0042T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To Understand Principle And Concepts Of Green Chemistry.
- To Understand The Types Of Catalysis And Industrial Applications.
- To Apply Green Solvents In Chemical Synthesis.
- To Enumerate Different Sourced Of Green Energy.
- To Apply Alternative Greener Methods Foe Chemical Reactions

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Apply the Green chemistry Principles for day to day life as well as synthesis, describe the sustainable development and green chemistry, Explain economic and un-economic reactions, Demonstrate Polymer recycling.
- Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries, Differentiate Homogeneous and Heterogeneous catalysis, Identify the importance of Bio and Photo Catalysis, Discuss Transition metal and Phase transfer Catalysis
- Demonstrate Green solvents and importance, Discuss Supercritical carbondioxide, Explain Supercritical water, recycling of green solvents.
- Describe importance of Biomass and Solar Power, Illustrate Sonochemistry, Apply Green Chemistry for Sustainable Development; discuss the importance of Renewable resources, mechanochemical synthesis.
- Discuss Alternative green methods like Photoredox catalysis, single electron transfer reactions (SET), Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Principles and Concepts of Green Chemistry** | **10Hrs** |

Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling

| **Unit-II** | **Catalysis and Green Chemistry** | **9Hrs** |
|---|---|---|

Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries,Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio-catalysis and Photo-catalysis with examples.

| **Unit -III** | **Green Solvents in Chemical Synthesis** | **10Hrs** |
|---|---|---|

Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbondioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recyling of green solvents.

| Unit -IV | Emerging Greener Technologies | 10Hrs |
|---|---|---|
| Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock‘s, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis. | | |
| **Unit -V** | **Alternative Greener Methods** | **9Hrs** |
| Photochemical Reactions - Examples, Advantages and Challenges, Photoredox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications. | | |
| • | | |

**Textbooks:**

1. M. Lancaster, Green Chemistry An Introductory Text, Royal Society Of Chemistry, 2002.
2. Paul T. Anastas And John C. Warner, Green Chemistry Theory And Practice, 4th Edition, Oxford University Press, Usa

**Reference Books:**

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.
2. Edited by AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH, 2013.

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## B.Tech IV Year I Semester

### EMPLOYABILITY SKILLS
**(Common To All Branches)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0046T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To encourage all round development of the students by focusing on productive skills
- To make the students aware of Goal setting and writing skills
- To enable them to know the importance of presentation skills in achieving desired goals.
- To help them develop organizational skills through group activities
- To function effectively with heterogeneous teams

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Understand the importance of goals and try to achieve them.
- Explain the significance of self-management.
- Apply the knowledge of writing skills in preparing eye-catchy resumes.
- Analyse various forms of Presentation skills.
- Judge the group behaviour appropriately.
- Develop skills required for employability.

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Goal Setting and Self-Management** | **10Hrs** |
| Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis | | |
| **Unit-II** | **Writing Skills** | **9Hrs** |
| Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover<br>Letters - E-Mail Etiquette -SoP (Statement of Purpose) | | |
| **Unit -III** | **Technical Presentation Skills** | **10Hrs** |
| Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation | | |
| **Unit -IV** | **Group Presentation Skills** | **10Hrs** |
| Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion-Debate –Corporate Etiquette | | |
| **Unit -V** | **Job Cracking Skills** | **9Hrs** |
| Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews | | |

**Textbooks:**

1. Sabina Pillai, Agna Fernandez. Soft Skills & Employability Skills,2014.Cambridge Publisher.
2. Alka Wadkar. Life Skills for Success, Sage Publications, 2016.

**Reference Books:**

1. Gangadhar Joshi. Campus to Corporate Paperback , Sage Publications. 2015
2. Sherfield Montogomery Moody,Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008
3. Shikha Kapoor. Personality Development and Soft Skills - Preparing for Tomorrow .1 Edition, Wiley, 2017.
4. M. Sen Gupta, Skills for Employability, Innovative Publication, 2019.
5. Steve Duck and David T McMahan, The Basics f Communication Skills A Relational Perspective, Sage press, 2012.

**Online Learning Resources:**

- https://youtu.be/gkLsn4ddmTs
- https://youtu.be/2bf9K2rRWwo
- https://youtu.be/FchfE3c2jzc
- https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
- https://www.youtube.com/c/skillopedia/videos
- https://onlinecourses.nptel.ac.in/noc25_hs96/preview
- https://onlinecourses.nptel.ac.in/noc21_hs76/preview
- https://archive.nptel.ac.in/courses/109/107/109107172/#
- https://archive.nptel.ac.in/courses/109/104/109104107/

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## B.Tech IV Year I Semester

### Geo-Spatial Technologies
### (CSE, AI&ML, CS, DS, ECE, EEE, ME)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0153T | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OE |

**Course Objectives: The objectives of the course are to make the students learn about**

- To understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
- To Analyse vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
- To apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
- To evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
- To assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

**Course Outcomes(CO):**

**Upon completion of this course, students should be able to:**

- Understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
- Analyse vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
- Apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
- Evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
- Assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

| Syllabus | | Total Hours:42 |
|---|---|---|
| **Unit-I** | **Raster Analysis** | **8Hrs** |

Raster Data Exploration: Query Analysis - Local Operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations—Neighborhood - Operations: Aggregation, Filtering – Extended Neighborhood-Operations- Zonal Operations - Statistical Analysis – Cost-Distance Analysis-Least Cost Path.

| | | |
|---|---|---|
| **Unit-II** | **Vector Analysis** | **9Hrs** |

Non-Topological Analysis: Attribute Database Query, Structured Query Language, Co-Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance – topological Analysis: Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line-In-Polygon, Polygon-On-Polygon: Clip, Erase, Identity, Union, Intersection – Proximity Analysis: Buffering

| | | |
|---|---|---|
| **Unit-III** | **Network Analysis** | **9Hrs** |

Network – Introduction - Network Data Model – Elements of Network - Building A Network Database - Geocoding – Address Matching - Shortest Path in A Network – Time and Distance Based Shortest Path Analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis

| Unit-IV | Surface and Geostatistical Analysis | 8Hrs |
|---|---|---|
| Surface Data – Sources of X,Y, Z Data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram. | | |
| **Unit-V** | **Customization, Web GIS, Mobile Mapping** | **8Hrs** |
| Customization of GIS: Need, Uses, Scripting Languages –Embedded Scripts – Use of Python Script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web Applications- Location Based Services: Emergency and Business Solutions - Big Data Analytics. | | |

**Text Books:**

1. Kang – Tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill Edition, 2008.
2. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

**Reference Books:**

1. Michael N. Demers, Fundamentals of Geographic Information Systems, Wiley,2009
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, ―An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.
3. John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Pub.,2008

**Online Learning Resources:**

- https://archive.nptel.ac.in/courses/105/105/105105202/
- https://onlinecourses.nptel.ac.in/noc19_cs76/preview

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**B.Tech IV Year I Semester**

**SOLID WASTE MANAGEMENT**
**(CSE, AI&ML, CS, DS, ECE, EEE, ME)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0154T | 3:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OE |

**Course Objectives:**

**The objectives of the course are to make the students learn about**

- To understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
- To Analyse engineering systems for solid waste collection, storage, and transportation.
- To apply resource and energy recovery techniques for sustainable solid waste management.
- To evaluate landfill design, construction, and environmental impact mitigation strategies.
- To assess hazardous waste management techniques, including biomedical and e-waste disposal.

**Course Outcomes(CO):**

**Upon completion of this course, students should be able to:**

- Understand the types, sources, and characteristics of solid waste, along with Regulatory frameworks.
- Analyze engineering systems for solid waste collection, storage, and transportation.
- Apply resource and energy recovery techniques for sustainable solid waste Management..
- Evaluate landfill design, construction, and environmental impact mitigation strategies
- Assess hazardous waste management techniques, including biomedical and e-waste.

| Syllabus | | Total Hours:42 |
|---|---|---|
| **Unit-I** | **Solid Waste** | **8Hrs** |
| Definitions, Types of Solid Wastes, Sources of Solid Wastes, Characteristics, and Perspectives; Properties of Solid Wastes, Sampling of Solid Wastes, Elements of Solid Waste Management - Integrated Solid Waste Management, Solid Waste Management Rules 2016. | | |
| **Unit-II** | **Engineering Systems for Solid Waste Management** | **9Hrs** |
| Solid Waste Generation; On-Site Handling, Storage and Processing; Collection of Solid Wastes; Stationary Container System and Hauled Container Systems – Route Planning - Transfer and Transport; Processing Techniques; | | |
| **Unit-III** | **Engineering Systems for Resource and Energy Recovery** | **9Hrs** |
| Processing Techniques; Materials Recovery Systems; Recovery of Biological Conversion Products – Composting, Pre and Post Processing, Types of Composting, Critical Parameters, Problems With Composing - Recovery of Thermal Conversion Products; Pyrolisis, Gasification, RDF - Recovery of Energy From Conversion Products; Materials and Energy Recovery Systems. | | |
| **Unit-IV** | **Landfills** | **8Hrs** |
| Evolution of Landfills – Types and Construction of Landfills – Design Considerations – Life of Landfills- Landfill Problems – Lining of Landfills – Types of Liners – Leachate Pollution and Control – Monitoring Landfills – Landfills Reclamation. | | |
| **Unit-V** | **Hazardous Waste Management** | **8Hrs** |
| Sources and Characteristics, Effects On Environment, Risk Assessment – Disposal of Hazardous Wastes – Secured Landfills, Incineration - Monitoring – Biomedical Waste Disposal, E-Waste Management, Nuclear Wastes, Industrial Waste Management | | |

**Text Books:**

1. Tchobanoglous G, Theisen H and Vigil SA _Integrated Solid Waste Management, Engineering Principles and Management Issues‘ McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, _Solid Waste Engineering‘ Brooks/Cole Thomson Learning Inc., 2002.

**Reference Books:**

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, _Environmental Engineering‘, McGraw Hill Inc., New York, 2017.
2. Qian X, Koerner RM and Gray DH, _Geotechnical Aspects of Landfill Design and Construction‘ Prentice Hall, 2002.

**Online Learning Resources:**

- https://archive.nptel.ac.in/courses/105/103/105103205/
- https://archive.nptel.ac.in/courses/120/108/120108005/

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**B.Tech IV Year I Semester**

**ELECTRIC VEHICLES**
**(Common to All Branches Except EEE)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0242T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- Remember and understand the differences between conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.
- Analyze various EV configurations, parameters of EV systems and Electric vehicle dynamics.
- Analyze the basic construction, operation and characteristics of fuel cells and battery charging techniques in HEV systems.
- Design and analyze the various control structures for Electric vehicle

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.
- Understand Various dynamics of Electric Vehicles.
- Understand various configurations in parameters of EV system and dynamic aspects of EV.
- Analyze fuel cell technologies in EV and HEV systems.
- Analyze the battery charging and controls required of EVs.

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Introduction to EV Systems and Energy Sources** | **10Hrs** |

Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive- In-wheel drives- EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment- History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.

| | | |
|---|---|---|
| **Unit-II** | **EV Propulsion and Dynamics** | **9Hrs** |

Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi-motor configurations- Fixed and variable geared transmission- In-wheel motor configuration- Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration.

| | | |
|---|---|---|
| **Unit -III** | **Fuel Cells** | **10Hrs** |

Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.

| | | |
|---|---|---|
| **Unit -IV** | **Battery Charging and Control** | **10Hrs** |

Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction. Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach- PI controller‘s designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.

| Unit -V | Energy Storage Technologies | 9Hrs |
|---|---|---|
| Role of Energy Storage Systems- Thermal- Mechanical-Chemical- Electrochemical- Electrical - Efficiency of energy storage systems- Super capacitors-Superconducting Magnetic Energy Storage(SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and Smart grid- Energy Management with storage systems- Battery SCADA | | |

**Textbooks:**

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition
2. Ali Emadi, Advanced Electric Drive Vehicles‖, CRC Press, 2017,1st Edition

**Reference Books:**

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt,‖ Energy Storage in Power Systems‖ Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016,1st Edition
3. A.G.Ter-Gazarian, ―Energy Storage for Power Systems‖, the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, ―Modern Elelctric, Hybrid Elelctric and Fuel Cell Vehicles: Fundamentals, Theory and Design‖, CRC Press, 2004,1st Edition
5. James Larminie, John Lowry, ―Electric Vehicle Technology Explained‖, Wiley, 2003,2nd Edition.

**Online Learning Resources:**

1. https://nptel.ac.in/courses/108/102/108102121/
2. https://nptel.ac.in/syllabus/108103009

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**B.Tech IV Year I Semester**

| TOTAL QUALITY MANAGEMENT (Common to all Branches Except ME) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0334Td** | **3: 0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

This course will enable students:

- Familiarize the basic concepts of Total Quality Management.
- To illustrate finite state machines to solve problems in computing
- Expose with various quality issues in Inspection.
- Gain Knowledge on quality control and its applications to real time..
- Understand the extent of customer satisfaction by the application of various quality concepts.
- Demonstrate the importance of Quality standards in Production

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Define and develop on quality Management philosophies and analyze quality costs frameworks
- Understanding of the historical development of Total Quality Management (TQM), implementation, and real-world applications through case studies.
- Evaluate the cost of poor quality, process effectiveness and efficiency to analyze areas for improvement.
- Apply benchmarking and business process reengineering to improve management processes.
- Demonstrate the set of indications to evaluate performance excellence of an organization

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit-I** | **Introduction:** | **9 Hrs** |
| Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management. | | |
| **Unit--II** | **Historical Review:** | **10 Hrs** |
| Historical Review: Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies. | | |
| **Unit-III** | **TQM Principles:** | **10 Hrs** |
| Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures Basic Concepts, Strategy, Performance Measure Case studies. | | |
| **Unit-IV** | **TQM Tools:** | **10 Hrs** |
| Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.. | | |

| Unit--V | Quality Systems: | 9 Hrs |
|---|---|---|

Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies.

**Text Books:**


1. Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2015.
2. Subburaj Ramaswamy, Total Quality Management, Tata McGraw Hill Publishing Company Ltd., 2005.
3. Joel E.Ross , Total Quality Management, Third Edition, CRC Press, 2017.


**Reference Books:**


1. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, New Age International, 1996.
2. Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993.
3. Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015
4. Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995.


**Web References:**


1. https://www.youtube.com/watch?v=VD6tXadibk0
2. https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
3. https://blog.capterra.com/what-is-total-quality-management/
4. https://nptel.ac.in/courses/110/104/110104080/
5. https://onlinecourses.nptel.ac.in/noc21_mg03/preview
6. https://nptel.ac.in/courses/110/104/110104085/
7. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-mg39/

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## B.Tech IV Year I Semester

| TRANSDUCERS AND SENSORS (Common To All Branches Except ECE) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| 23A0444T | **3:0:0** | **3** | **CIE:30 & SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To understand characteristics of Instrumentation System and the operating principle of motion transducers.
- To explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
- To provide knowledge on flow transducers and their applications.
- To study the working principles of pressure transducers.
- To introduce working principle and applications of force and sound transducers.

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Understand characteristics of Instrumentation System and the operating principle of motion transducers.
- Explore working principles, and applications of different temperature transducers
- Gain knowledge on flow transducers and their applications.
- Learn the working principles of pressure transducers.
- Understand the working principle and applications of force and sound transducers.
- Explore working principles, and applications of Piezo-electric sensors.

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Introduction & Motion Transducers** | **10Hrs** |

**Introduction:** General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.
**Motion Transducers:** Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

| **Unit-II** | **Temperature Transducers** | **9Hrs** |
|---|---|---|

**Temperature Transducers:** Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics. Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

| **Unit -III** | **Flow Transducers** | **10Hrs** |
|---|---|---|

**Flow Transducers:** Bernoulli‘s principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

| **Unit -IV** | **Pressure Transducers** | **10Hrs** |
|---|---|---|

**Pressure Transducers:** Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement

| Unit -V | Force and Sound Transducers | 9Hrs |
|---|---|---|
| **Force and Sound Transducers:** Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone**.** Inductive sensor, Capacitive sensors, Thermal sensors. | | |

**Textbooks:**

1. A.K. Sawhney, ―A course in Electrical and Electronics Measurements and Instrumentation‖, Dhanpat Rai& Co. 3rd edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V, ―Instrumentation Devices and Systems‖, TATA McGraw Hill publications, 2007.

**Reference Books:**

1. Doebelin. E.O, ―Measurement Systems Application and Design‖,McGraw Hill International, New York, 2004.
2. Nakra B.C andChaudharyK.K , ―Instrumentation Measurement and Analysis‖, Second Edition, Tata McGraw-Hill Publication Ltd.2006.

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**B.Tech IV Year I Semester**

## INTRODUCTION TO QUANTUM COMPUTING
**(Common to all branches)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A3315a | 3:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To introduce the principles and mathematical foundations of quantum computation.
- To understand quantum gates, circuits, and computation models.
- To explore quantum algorithms and their advantages over classical ones.
- To develop the ability to simulate and write basic quantum programs.
- To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Explain the fundamental concepts of quantum mechanics used in computing.
- Construct and analyze quantum circuits using standard gates.
- Apply quantum algorithms like Deutsch-Jozsa, Grover‘s, and Shor‘s.
- Develop simple quantum programs using Qiskit or similar platforms.
- Analyze applications and challenges of quantum computing in real-world domains.

| Syllabus | | Total Hours: 48Hrs |
|---|---|---|
| **Unit-I** | **Fundamentals of Quantum Mechanics and Linear Algebra** | **10Hrs** |
| Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems. | | |
| **Unit-II** | **Quantum Gates and Circuits** | **9Hrs** |
| Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits. | | |
| **Unit -III** | **Quantum Algorithms and Complexity** | **10Hrs** |
| Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover‘s Search Algorithm, Shor‘s Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA | | |
| **Unit -IV** | **Quantum Programming and Simulation Platforms** | **10Hrs** |
| Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware | | |
| **Unit -V** | **Applications and Future of Quantum Computing** | **9Hrs** |
| Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions. | | |

**Textbooks:**


1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.


**Reference Books:**


1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.


**Web References:**

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
3. edX – The Quantum Internet and Quantum Computers
4. YouTube – Quantum Computing for the Determined by Michael Nielsen
5. Qiskit Textbook – IBM Quantum

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**B.Tech IV Year I Semester**

## FINANCIAL MATHEMATICS
**(Common to all branches)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0032T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To provide mathematical foundations for financial modelling, risk assessment and asset pricing.
- To introduce stochastic models and their applications in pricing derivatives and interest rate modelling.
- To develop analytical skills for fixed-income securities, credit risk, and investment strategies.
- To equip students with computational techniques for pricing financial derivatives.

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Explain fundamental financial concepts, including arbitrage, valuation, and risk.
- Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts.
- Analyze mathematical techniques for pricing options and financial derivatives.
- Evaluate interest rate models and bond pricing methodologies.
- Utilize computational techniques such as Monte Carlo simulations for financial modelling.

| Syllabus | | Total Hours: 40Hrs |
|---|---|---|
| **Unit-I** | **Asset Pricing and Risk Management** | **8Hrs** |

Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP Model, Efficient market hypothesis.

| Unit-II | Stochastic Models in Finance | 8Hrs |
|---|---|---|

Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito‘s Lemma, Ito Integral, and Ito Isometry.

| Unit -III | Interest Rate and Credit Modelling | 8Hrs |
|---|---|---|

Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models, Credit risk modelling: Hazard function and hazard rate.

| Unit -IV | Fixed-Income Securities and Bond Pricing | 8Hrs |
|---|---|---|

Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage Backed Securities.

| Unit -V | Exotic Options and Computational Finance | 8Hrs |
|---|---|---|

Stochastic volatility models and the Feynman-Kac theorem. Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.

**Textbooks:**

1. Ales Cerny, *Mathematical Techniques in Finance: Tools for Incomplete Markets*, Princeton University Press.
2. S.R. Pliska, *Introduction to Mathematical Finance: Discrete-Time Models*, Cambridge University Press.

**Reference Books:**

1. Ioannis Karatzas & Steven E. Shreve, Methods of Mathematical Finance, Springer, New York.
2. John C. Hull, Options, Futures, and Other Derivatives, Pearson.

**Web References:**

1. MIT– Mathematics for Machine Learning https://ocw.mit.edu
2. Coursera – Financial Engineering and Risk Management (Columbia University) https://www.coursera.org/
3. National Stock Exchange (NSE) India – Financial Derivatives https://www.nseindia.com/

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## B.Tech IV Year I Semester

**SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS**
**(Common to all branches)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0038T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To provide exposure to various kinds of sensors and actuators and their engineering applications.
- To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
- To explain the operating principles of various sensors and actuators
- To educate the fabrication of sensors
- To explain the required sensor and actuator for interdisciplinary application

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Classify different types of Sensors and Actuators along with their characteristics
- Summarize various types of Temperature and Mechanical sensors
- Illustrates various types of optical and mechanical sensors
- Analyze various types of Optical and Acoustic Sensors
- Interpret the importance of smart materials in various devices

| Syllabus | | Total Hours: 40Hrs |
|---|---|---|
| **Unit-I** | **Introduction to Sensors and Actuators** | **8Hrs** |

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only),
Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching. Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

| | | |
|---|---|---|
| **Unit-II** | **Temperature and Mechanical Sensors** | **8Hrs** |

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).

| | | |
|---|---|---|
| **Unit -III** | **Optical and Acoustic Sensors** | **8Hrs** |

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones

| | | |
|---|---|---|
| **Unit -IV** | **Magnetic and Electromagnetic Sensors** | **8Hrs** |

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.

| Unit -V | Chemical and Radiation Sensors | 8Hrs |
|---|---|---|
| Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors. Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission) | | |

**Textbooks:**

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

**Reference Books:**

1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.

**Web References:**

1. **NPTEL course link:** **https://onlinecourses.nptel.ac.in/noc21_ee32/preview**

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## B.Tech IV Year I Semester

| CHEMISTRY OF NANOMATERIALS AND APPLICATIONS (Common to all branches) | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P:S** | **Credits** | **Exam Marks** | **Exam Duration** | **Course Type** |
| **23A0043T** | **3:0:0:0** | **3** | **CIE:30 & SEE:70** | **3 Hours** | **OE** |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To understand basics and characterization of nanomaterials.
- To understand synthetic methods of nanomatrials.
- To apply various techniques for charterization of nanomaterials.
- To understand Studies of Nano-structured Materials
- To enumerate the applications of advanced nanomaterials in engineering

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Classify the nanostructure materials; describe scope of nanoscience and importance technology.
- Describe the top-down approach, Explain aerosol synthesis and plasma arc technique, Differentiate chemical vapor deposition method and electrode position method, Discuss about highenergy ball milling.
- Discuss different technique for characterization of nanomaterial, Explain electron microscopy techniques for characterization of nanomaterial, Describe BET method for surface area analysis.
- Explain synthesis and properties and applications of nanaomaterials, Discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, nonlinear optical materials.
- Illustrate advance engineering applications of Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

| Syllabus | | Total Hours: 40Hrs |
|---|---|---|
| **Unit-I** | **Basics and Characterization of Nanomaterials** | **8Hrs** |

**Basics and Characterization of Nanomaterials:** Introduction**,** Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nanomaterials.

| | | |
|---|---|---|
| **Unit-II** | **Synthesis of nanomaterials** | **8Hrs** |

**Synthesis of nanomaterials :**Top-Down approach**,** Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, highenergy ball milling method. Synthetic Methods**:** Bottom-Up approach**,** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

| | | |
|---|---|---|
| **Unit -III** | **Techniques for characterization** | **8Hrs** |

**Techniques for characterization:** Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

| Unit -IV | Studies of Nano-structured Materials | 8Hrs |
|---|---|---|

**Studies of Nano-structured Materials:** Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes, 2D-nanomaterial (Graphene), core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.

| Unit -V | Advanced Engineering Applications of Nanomaterials | 8Hrs |
|---|---|---|

**Advanced Engineering Applications of Nanomaterials:** Applications of Nano Particle, nanorods, nano wires, Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

**Textbooks:**


1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012.


**Reference Books:**


1. Concepts of Nanochemistry; LudovicoCademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Wiley-VCH, 2011.
2. Nanostructures &Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.

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**B.Tech IV Year I Semester**

**LITERARY VIBES**
**(Common to all branches)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0047T | 3:0:0:0 | 3 | CIE:30 & SEE:70 | 3 Hours | OE |

**Course Objectives:**

The objectives of the course are to make the students learn about:

- To inculcate passion for aesthetic sense and reading skills
- To encourage respecting others‘ experiences and creative writing
- To explore emotions, communication skills and critical thinking
- To educate how books serve as the reflection of history and society
- To provide practical wisdom and duty of responding to events of the times

**Course Outcomes(CO):**

After the completion of the course students will able to:

- Identify genres, literary techniques and creative uses of language in literary texts.
- Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces
- Apply knowledge and understanding of literary texts when responding to others‘ problems and their own and make evidence-based arguments
- Analyze the underlying meanings of the text by using the elements of literary texts L4
- Evaluate their own work and that of others critically
- Develop as creative, effective, independent and reflective students who are able to make informed choices in process and performance

| Syllabus | | Total Hours: 40Hrs |
|---|---|---|
| **Unit-I** | **Poetry** | **8Hrs** |

1. Ulysses- Alfred Lord Tennyson
2. Ain’t I woman?-Sojourner Truth
3. The Second Coming-W.B. Yeats
4. Where the Mind is Without Fear-Rabindranath Tagore

| | | |
|---|---|---|
| **Unit-II** | **Drama: *Twelfth Night*- William Shakespeare** | **8Hrs** |

1. Shakespeare -life and works
1. Plot & sub-plot and Historical background of the play
2. Themes and Criticism
3. Style and literary elements
4. Characters and characterization

| | | |
|---|---|---|
| **Unit -III** | **Short Story** | **8Hrs** |

1. The Luncheon - Somerset Maugham
2. The Happy Prince-Oscar Wild
3. Three Questions – Leo Tolstoy
4. Grief –Antony Chekov

| | | |
|---|---|---|
| **Unit -IV** | **Prose: Essay and Autobiography** | **8Hrs** |

1. My struggle for an Education-Booker T Washington
2. The Essentials of Education-Richard Livingston
3. The story of My Life-Helen Keller
4. Student Mobs-JB Priestly

| Unit -V | Novel: *Hard Times*- Charles Dickens | 8Hrs |
|---|---|---|
| 1. Charles Dickens-Life and works<br>2. Plot and Historical background of the novel<br>3. Themes and criticism<br>4. Style and literary elements<br>5. Characters and characterization | | |
| **Textbooks:**<br>1. Charles Dickens.Hard Times.(Sangam Abridged Texts) Vantage Press, 1983<br>**2.** DENT JC.William Shakespeare. Twelfth Night. Oxford University Press,2016. | | |
| **Reference Books:**<br>1. WJ Long.History of English Literature, Rupa Publications India; First Edition (4 October 2015)<br>2. RK Kaushik And SC Bhatia. Essays, Short Stories and One Act Plays, Oxford University Press .2018.<br>3. Dhanvel, SP. English and Soft Skills, Orient Blackswan,2017.<br>4. New Horizon, Pearson publications, New Delhi 2014<br>5. Vimala Ramarao, Explorations Volume-II, Prasaranga Bangalore University,2014.<br>**6.** Dev Neira, Anjana & Co. Creative Writing: A Beginner's Manual.Pearson India, 2008. | | |
| **Online Resources**<br>• https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses<br>• https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis<br>• https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette<br>• https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/<br>• https://www.litcharts.com/lit/twelfth-night/themes<br>• https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony/ | | |

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**B.Tech IV Year I Semester**

**PROMPT ENGINEERING**
(Common to aligned branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0540P | 0: 1:2:0 | 2 | CIE:30 SEE:70 | 3 Hours | SE |

**Course Objectives:**

This course will enable students:

This course delves into prompt engineering principles, strategies, and best practices, a crucial aspect in shaping AI models' behavior and performance. Understanding Prompt Engineering is a comprehensive course designed to equip learners with the knowledge and skills to effectively generate and utilize prompts in natural language processing (NLP) and machine learning (ML) applications. This course delves into prompt engineering principles, strategies, and best practices, a crucial aspect in shaping AI models' behavior and performance.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Understanding the fundamentals and evolution of prompt engineering.
- Gaining the ability to craft effective closed-ended, open-ended, and role-based prompts.
- Learning to probe and stress-test AI models for bias and robustness.
- Applying prompt optimization techniques and performance evaluation methods.
- Mitigating bias and promoting ethical prompting practices in NLP/ML systems.

| Syllabus | | Total Hour |
|---|---|---|
| **Unit-I** | **Introduction to Prompt Engineering** | **8Hrs** |

Lesson 1: Foundations of Prompt Engineering o

- Overview of prompt engineering and its significance in NLP and ML.
- Historical context and evolution of prompt-based approaches.

| | | |
|---|---|---|
| **Unit-II** | **Types of Prompts and Their Applications** | **8 Hrs** |

Lesson 2: Closed-Ended Prompts

- Understanding and creating prompts for specific answers. O
- Applications in question- answering systems.

Lesson 3: Open-Ended Prompts

- Crafting prompts for creative responses.
- Applications in language generation models.

| | | |
|---|---|---|
| **Unit-III** | **Strategies for Effective Prompting** | **8 Hrs** |

Lesson 4: Probing Prompts o

- Designing prompts to reveal model biases.
- Ethical considerations in using probing prompts.

Lesson 5: Adversarial Prompts

- Creating prompts to stress-test models.
- Enhancing robustness through adversarial prompting.

| Unit-IV | Fine-Tuning and Optimizing with Prompts | 8Hrs |
|---|---|---|

Lesson 6: Fine-Tuning Models with Prompts

- Techniques for incorporating prompts during model training.
- Balancing prompt influence and generalization.

Lesson 7: Optimizing Prompt Selection

- Methods for selecting optimal prompts for specific tasks.
- Customizing prompts based on model behavior.

| Unit-V | Evaluation and Bias Mitigation | 8Hrs |
|---|---|---|

Lesson 8: Evaluating Prompt Performance

- Metrics and methodologies for assessing model performance with prompts.
- Interpreting and analyzing results.

Lesson 9: Bias Mitigation in Prompt Engineering

- Strategies to identify and address biases introduced by prompts.
- Ensuring fairness and inclusivity in prompt-based models.

| Unit-VI | Real-World Applications and Case Studies | 8Hrs |
|---|---|---|

Lesson 10: Case Studies in Prompt Engineering

- Exploration of successful implementations and challenges in real-world scenarios.
- Guest lectures from industry experts sharing their experiences.

**Text Books:**

1. "Prompt Engineering in Action" – Danny D. Sullivan
2. "The Art of Prompt Engineering with Chat GPT: A Hands-On Guide" – Nathan Hunter.

**Reference Books:**

1. "Prompt Engineering in Practice" – Michael F. Lewis.
2. . "Mastering AI Prompt Engineering: The Ultimate Guide for Chat GPT Users" – Adriano Damiao
3. "Writing AI Prompts For Dummies" – Stephanie Diamond and Jeffrey Allan
4. "Prompt Engineering Guide" (Online Resource) – promptingguide.ai

**Web References:**

1. https://www.udemy.com/course/understanding-prompt-engineering/?couponCode=NVDINCTA35TRT

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**B.Tech IV Year I Semester**

**GENDER SENSITIZATION**
(Common to all Branches)

| Course Code | L:T:P:C | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0054T | 0:0:2:0 | - | - | - | MC |

**Course Objectives:**

This course will enable students to:

- To enable students to understand the gender related issues, vulnerability of women and men
- To familiarize them about constitutional safeguard for gender equality
- To expose the students to debates on the politics and economics of work
- To help students reflect critically on gender violence
- To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

**Course Outcomes:**

**On completion of this course, student will be able to**

- Understand the basic concepts of gender and its related terminology
- Identify the biological, sociological, psychological and legal aspects of gender.
- Use the knowledge in understanding how gender discrimination works in our Society and how to counter it
- Analyze the gendered division of labour and its relation to politics and economics.
- Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups
- Develop students‘ sensibility with regard to issues of gender in contemporary India

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **UNDERSTANDING GENDER** | **10 Hrs** |

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

| | | |
|---|---|---|
| **Unit-II** | **GENDER ROLES AND RELATIONS** | **10 Hrs** |

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences-Declining Sex Ratio- Demographic Consequences-Gender Spectrum -

| | | |
|---|---|---|
| **Unit-III** | **GENDER AND LABOUR** | **9 Hrs** |

Division and Valuation of Labour-Housework: The Invisible Labor- ―My Mother doesn‘t Work.‖ ―Share the Load.‖-Work: Its Politics and Economics -Fact and Fiction- Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

| | | |
|---|---|---|
| **Unit-IV** | **GENDER-BASED VIOLENCE** | **9 Hrs** |

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

| Unit-V | GENDER AND CULTURE | 10 Hrs |
|---|---|---|
| Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues- Gender Sensitive Language- Just Relationships | | |

**Text Books:**

1. A.Suneetha, Uma Bhrugubanda, et al. Towards a World of Equals: A Bilingual Textbook on Gender‖, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. Gender Trouble: Feminism and the Subversion of Identity. UK Paperback Edn. March 1990

**Reference Books:**

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The dowry Problems in India,London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002
3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, Anupama Sihag, Gender Sensitization: Issues and Challenges (English, Hardcover), Raj Publications, 2019
6. A.Revathy & Murali, Nandini, A Life in Trans Activism(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016

**Web References:**

1. Understanding Gender
   chrome extension://kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf
   https://onlinecourses.swayam2.ac.in/nou24_hs53/preview
2. Gender Roles and Relations
   https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are gender-roles-and-stereotypes
   https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our relationships-7499408
   https://onlinecourses.swayam2.ac.in/cec23_hs29/preview
3. Gender and Labour
   https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and how-can-it-be-redressed
   https://onlinecourses.nptel.ac.in/noc23_mg67/preview
4. GENDER-BASED VIOLENCE
   https://eige.europa.eu/gender-based-violence/what-is-gender-based violence?language_content_entity=en
   https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and girls
   https://onlinecourses.swayam2.ac.in/nou25_ge38/preview
5. GENDER AND CULTURE
   https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/
   https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/
   https://archive.nptel.ac.in/courses/109/106/109106136/
   Abdulali Sohaila. ―I Fought For My Life…and Won.‖Available online (at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/ 10

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| IV Year II Semester (PR-1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | PR | 23A0542 | Internship | - | - | 24 | 4 |
| | | | Project | - | - | - | 8 |
| **Total** | | | | | | | **12** |

# RG 23

# OPEN ELECTIVE COURSES OFFERED BY CSE TO OTHER DEPARTMENTS

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## Courses offered by CSE (RG23) to Other Departments

| S.NO | SUB CODE | SUB NAME | YEAR & SEM | BRANCH/BRANCHES |
|---|---|---|---|---|
| 1 | 23A0501T | Introduction to Programming | I-I | All Branches |
| 2 | 23A0502P | Computer Programming Lab | I-I | All Branches |
| 3 | 23A0517P | **Skill Oriented Course:** Data Structures | II-I | EEE |
| 4 | 23A0522T | Introduction to Quantum Technologies & Applications | III-I | All Branches |
| 5 | 23A0543T | Computer Architecture & Organization | III-I | ECE |
| 6 | 23A0544T | Artificial Intelligence & Machine Learning | III-II | ECE |
| 7 | 23A0549T | AI & ML for Mechanical Engineering | IV-I | ME |
| **Open Electives** | | | | |
| 8 | 23A0545T | Java Programming | III-I | All Branches Except CSE(Aligned) |
| 9 | 23A0546T | Fundamentals of Artificial Intelligence | III-I | All Branches Except CSE(Aligned) |
| 10 | 23A0547T | Quantum Technologies & Applications | III-I | All Branches Except CSE(Aligned) |
| 11 | 23A0548T | Fundamentals of Operating Systems | III-II | All Branches Except CSE(Aligned) |
| 12 | 23A0529T | Machine Learning | III-II | All Branches Except CSE(Aligned) |
| 13 | 23A0512T | Data Base Management Systems | IV-I | All Branches Except CSE(Aligned) |
| 14 | 23A0532Tb | Cyber Security | IV-I | All Branches Except CSE(Aligned) |
| 15 | 23A0520T | Computer Networks & Internet Protocols | IV-I | All Branches Except CSE(Aligned) |
| 16 | 23A0450T | Internet of Things | IV-I | All Branches Except CSE(Aligned) |
| 17 | 23A3315a | Introduction to Quantum Computing | IV-I | All Branches Except CSE(Aligned) |

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## INTRODUCTION TO PROGRAMMING
### (Common to all branches)

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0501T | 3:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PCC |

**Course Objectives:**

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions and arrays.
- To encourage collaborative learning and team work in coding projects.

**Course Outcomes (CO):**

On completion of this course, the students are able to:

**CO1:** Understand basics of computers, the concept of algorithm and algorithmic thinking.

**CO2:** Analyse a problem and develop an algorithm to solve it.

**CO3:** Implement various algorithms using the C programming language.

**CO4:** Understand more advanced features of C language.

**CO5:** Develop problem-solving skills and the ability to debug and optimize the code.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit- I** | **Introduction to Programming and Problem Solving** | **10** |

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool),pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting. Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms

| | | |
|---|---|---|
| **Unit- II** | **Control Structures** | **8** |

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue..

| | | |
|---|---|---|
| **Unit- III** | **Arrays and Strings** | **10** |

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings

| | | |
|---|---|---|
| **Unit- IV** | **Pointers & User Defined Data types** | **10** |

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types - Structures and Unions.

| | | |
|---|---|---|
| **Unit- V** | **Functions & File Handling** | **10** |

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, command line arguments, Preprocessor directives, Basics of File Handling

**Textbooks:**

1. "The C Programming Language", Brian W.Kernighan and Dennis M.Ritchie,Prentice-Hall,1988
2. Schaum's Outline of Programming with C,Byron SGottfried, McGraw-HillEducation,1996

**Reference Books:**

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-HillEducation, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

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## COMPUTER PROGRAMMING LAB
(Common to CSE, AI&ML, DS, CS, CE)

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0502P | 0:0:3 | 1.5 | CIE: 30 SEE:70 | 3 Hours | ES |

**Course Objectives:**

The course aims to give students hands – on experience and train them on the concepts of the C-programming language.

**Course Outcomes (CO):**

**CO1:** Read, understand, and trace the execution of programs written in C language.
**CO2:** Select the right control structure for solving the problem.
**CO3:** Develop C programs which utilize memory efficiently using programming constructs like pointers.
**CO4:** Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

**Syllabus**

**WEEK 1**

**Objective:** Getting familiar with the programming environment on the computer and writing the first program.

**Suggested Experiments/Activities:**
**Tutorial 1:** Problem-solving using Computers.
**Lab1:** Familiarization with programming environment
i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

**WEEK 2**

**Objective:** Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.
**Suggested Experiments /Activities:**
**Tutorial 2:** Problem-solving using Algorithms and Flow charts.
**Lab 1:** Converting algorithms/flow charts into C Source code.
Developing the algorithms/flowcharts for the following sample programs
i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

**WEEK 3**

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

**Suggested Experiments/Activities:**
**Tutorial 3:** Variable types and type conversions:
**Lab 3:** Simple computational problems using arithmetic expressions.
i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

**WEEK 4**

**Objective:** Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

**Suggested Experiments/Activities:**

**Tutorial4:** Operators and the precedence and as associativity:

**Lab4:** Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.
   a. A+B*C+(D*E) + F*G
   b. A/B*C-B+A*D/3
   c. A+++B---A
   d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

**WEEK 5**

**Objective:** Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

**Suggested Experiments/Activities:**

**Tutorial 5:** Branching and logical expressions:

**Lab 5**: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

**WEEK 6**

**Objective:** Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

**Suggested Experiments/Activities:**

**Tutorial 6:** Loops, while and for loops

**Lab 6:** Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

**WEEK 7**

**Objective:** Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

**Suggested Experiments/Activities:**

**Tutorial 7:** 1 D Arrays: searching.

**Lab 7:**1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.

iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

### WEEK 8:

**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

**Suggested Experiments/Activities:**
**Tutorial 8:** 2 D arrays, sorting and Strings.
**Lab 8:** Matrix problems, String operations, Bubble sort
i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

### WEEK 9

**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C
**Suggested Experiments/Activities:**
**Tutorial 9:** Pointers, structures and dynamic memory allocation
**Lab 9:** Pointers and structures, memory dereference.
i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

### WEEK 10:

**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

**Suggested Experiments/Activities:**
**Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists
**Lab10 :** Bitfields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields
i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type.

and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

**Suggested Experiments/Activities:**
**Tutorial 9:** Pointers, structures and dynamic memory allocation
**Lab 9:** Pointers and structures, memory dereference.
i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures

iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

**WEEK 10:**

**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

**Suggested Experiments/Activities:**

**Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists

**Lab10 :** Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type.

**WEEK 11:**

**Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

**Suggested Experiments/Activities:**

**Tutorial 11:** Functions, call by value, scope and extent,

**Lab 11:** Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

**WEEK 12:**

**Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

**Suggested Experiments/Activities:**

**Tutorial 12:** Recursion, the structure of recursive calls

**Lab 12:** Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

**WEEK 13:**

**Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

**Suggested Experiments/Activities:**

**Tutorial 13:** Call by reference, dangling pointers

**Lab 13:** Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
iv) Write a C program to find no of lowercase, uppercase, digits and othercharacters using pointers.

**WEEK14:**

**Objective:** To understand data files and file handling with various file I/O functions. Explore thedifferences between text and binary files.

**Suggested Experiments/Activities:**

**Tutorial 14:** File handling

**Lab 14:** File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

**Textbooks:**

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

**Reference Books:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

**Web Resources**:

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**DATA STRUCTURES**
**(Common to EEE)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0543T | 0:1:2:0 | 2 | CIE:30 SEE:70 | 3 Hours | PCC |

**Course Objectives:**

This course will enable students to:

- Exploring basic data structures such as stacks and queues.
- Introduces variety of data structures such as hash linked list, trees and graphs.
- Introduces searching and sorting algorithms

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Understand the role of data structures in organizing and accessing data.
- Design, implement and apply linked lists for dynamic data storage
- Develop applications using stacks and queues
- Design and implement algorithms for operations on binary trees and binary search trees
- Design novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | | **10Hrs** |

Introduction to Data Structures: Definition and importance of Data structures, Abstract data types (ADTs) and its specifications,Arrays: Introduction, 1-D, 2-D Arrays, accessing elements of array, Row Major and Column Major storage of Arrays, Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Quick sort.

Sample experiments:

1. Program to find min & max element in an array.
2. Program to implement matrix multiplication.
3. Find an element in given list of sorted elements in an array using Binary search.
4. Implement Selection and Quick sort techniques.

| **Unit-II** | | **9Hrs** |
|---|---|---|

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

Sample experiments:

1. Write a program to implement the following operations.
   a. Insert b. Deletion c. Traversal
2. Write a program to store name, roll no, and marks of students in a class using circular double linked list.
3. Write a program to perform addition of given two polynomial expressions using linked list.

| **Unit-III** | | **10Hrs** |
|---|---|---|

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

Sample experiments:

1. Implement stack operations using
   a. Arrays b. Linked list
2. Convert given infix expression into post fix expression using stacks.
3. Evaluate given post fix expression using stack
4. Write a program to reverse given linked list using stack.

| **Unit-IV** | | **9Hrs** |
|---|---|---|

Queues: Introduction to queues: properties and operations, Circular queues, implementing queues using arrays and linked lists, Applications of queues scheduling, etc. Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

Sample experiments:

1. Implement Queue operations using
   a. Arrays b. Linked list
2. Implement Circular Queue using
   a. Arrays b. Linked list
3. Implement Dequeue using linked list.

| **Unit-V** | | **10Hrs** |
|---|---|---|

Trees: Introduction to Trees, Binary trees and traversals, Binary Search Tree – Insertion, Deletion & Traversal

Sample experiments:

1. Implement binary tree traversals using linked list.
2. Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations.

**Text Books:**

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, SartajSahni, Susan Anderson- Freed, Silicon Press, 2008

**Reference Books:**

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

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## INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS
(Common to All branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0522T | 3: 0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | PCC |

**Course Objectives:**

- Introduce fundamental quantum concepts like superposition and entanglement.
- Understand theoretical structure of qubits and quantum information.
- Explore conceptual challenges in building quantum computers.
- Explain principles of quantum communication and computing.
- Examine real-world applications and the future of quantum technologies.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Explain core quantum principles in a non-mathematical manner.
- Compare classical and quantum information systems.
- Identify theoretical issues in building quantum computers.
- Discuss quantum communication and computing concepts.
- Recognize applications, industry trends, and career paths in quantum technology

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction to Quantum Theory and Technologies** | **10Hrs** |

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India‘s Quantum Mission, EU, USA, China

| | | |
|---|---|---|
| **Unit-II** | **Theoretical Structure of Quantum Information Systems** | **9Hrs** |

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role

| | | |
|---|---|---|
| **Unit-III** | **Building a Quantum Computer – Theoretical Challenges and Requirements** | **10Hrs** |

What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Visionvs reality: what‘s working and what remains elusive, The role of quantum software in managing theoretical complexities

| Unit-IV | Quantum Communication and Computing – Theoretical Perspective | 9Hrs |
|---|---|---|
| Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential | | |
| **Unit-V** | **Applications, Use Cases, and the Quantum Future** | **10Hrs** |
| Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race | | |

**Text Books:**

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

**Reference Books:**

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.
4. Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.
5. Eleanor G. Rieffel, Wolfgang H. Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
6. Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.
7. Bruce Rosenblum, Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.
8. GiulianoBenenti, GiulioCasati, GiulianoStrini, Principles of Quantum Computation and Information, Volume I: Basic Concepts, World Scientific Publishing, 2004.
9. K.B. Whaley et al., Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document, Quantum Flagship, European Commission, 2020.
10. Department of Science & Technology (DST), Government of India, National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers, MeitY/DST Publications, 2020 onward.

**Web References:**

- IBM Quantum Experience and Qiskit Tutorials
- Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
- edX – The Quantum Internet and Quantum Computers
- YouTube – Quantum Computing for the Determined by Michael Nielsen
- Qiskit Textbook – IBM Quantum

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## COMPUTER ARCHITECTURE & ORGANIZATION
### (Common to ECE)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0543T | 3: 0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | PCC |

**Course Objectives:**

This course will enable students:

- To learn the design of various functional units of digital computers and performance issues of computer systems.
- To understand the basic processing unit and their connections.
- To get familiar with different types of Data representation and Computer Arithmetic operations.
- To know about different types of memory and their interconnections.
- To learn the basics of parallel computing and pipelining.

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Learn the design of various functional units of digital computers and performance issues of computer systems.
- Understand the basic processing unit and their connections.
- Know about different types of Data representation and Computer Arithmetic operations.
- Learn about different types of memory and their interconnections.
- Understand the basics of parallel computing and pipelining.

| Syllabus | Total Hours:48 |
|---|---|

| Unit-I | | 10Hrs |
|---|---|---|

**Digital Computers:** Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture. **Register Transfer Language and**

**Micro operations:** Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

**Basic Computer Organization and Design:** Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

| Unit-II | | 9Hrs |
|---|---|---|

**Micro programmed Control:** Control memory, Address sequencing, micro program example, design of control unit.

**Central Processing Unit:** General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

| Unit-III | | 10Hrs |
|---|---|---|

**Data Representation:** Data types, Complements, Fixed Point Representation, Floating Point Representation..

**Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

| Unit-IV | | 9Hrs |
|---|---|---|

**Input-Output Organization:** Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory

| Unit-V | | 10Hrs |
|---|---|---|

**Reduced Instruction Set Computer:** CISC Characteristics, RISC Characteristics. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor. Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor arbitration, Inter-processor communication and synchronization, Cache Coherence

**Text Books:**

3. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.

**Reference Books:**

6. Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.
7. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
8. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

**Web References:**

1. **https://nptel.ac.in/courses/106105163**
2. **https://onlinecourses.nptel.ac.in/noc22_cs88/preview**

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## ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
**(Common to ECE)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0544T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PCC |

**Course Objectives:**

This course will enable students to:

1. To learn the basics and problems of Artificial Intelligence with rationality and structure of agents.
2. To describe the search for solutions using various search strategies & algorithms for optimization.
3. To evaluate the representation of Agents with Propositional Logic in Shopping World.
4. To understand the concepts of Machine Learning with different Perspectives.
5. To analyze Decision Tree Representation with different problems& issues.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

1. To learn the basics and problems of Artificial Intelligence with rationality and structure of agents.
2. To describe the search for solutions using various search strategies & algorithms for optimization.
3. To evaluate the representation of Agents with Propositional Logic in Shopping World.
4. To understand the concepts of Machine Learning with different Perspectives.
5. To analyze Decision Tree Representation with different problems& issues.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | | **8Hrs** |

**Introduction:** What Is AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

| | | |
|---|---|---|
| **Unit-II** | | **10Hrs** |

**Problem Solving:** Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

| | | |
|---|---|---|
| **Unit-III** | | **8Hrs** |

**Knowledge Representation:** Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

| | | |
|---|---|---|
| **Unit-IV** | | **9Hrs** |

**Introduction to Machine Learning:** Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning.

**Concept Learning and The General-to-Specific Ordering:** Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination

| **Unit-V** | | **8Hrs** |
|---|---|---|

**Decision Tree Learning:** Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

**Text Books:**

1. Stuart Russell and Peter Norvig, ―Artificial Intelligence: A Modern Approach‖ , 3rd Edition, Pearson
2. Tom M. Mitchell, *Machine Learning*, McGraw Hill Edition, 2013 .

**Reference Books:**

1. Saroj Kaushik, ―Artificial Intelligence‖, Cengage Learning India, 2011
2. Elaine Rich and Kevin Knight, ―Artificial Intelligence‖, Tata McGraw Hill
3. David Poole and Alan Mackworth, ―Artificial Intelligence: Foundations for Computational Agents‖, Cambridge University Press 2010.
4. Trivedi, M.C., ―A Classical Approach to Artifical Intelligence‖, Khanna Publishing House, Delhi.
5. Christopher Bishop, Pattern Recognition and Machine Learning (PRML) , Springer, 2007.
6. ShaiShalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms (UML) , Cambridge University Press, 2014.

**Web References:**

1. **https://swayam.gov.in/nd1_noc19_me71/preview**
2. **https://nptel.ac.in/courses/106106139**

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## AI & ML FOR MECHANICAL ENGINEERING
**(Common to ME)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0549T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | PCC |

**Course Objectives:**

This course will enable students to:

1. Knowledge of Artificial Intelligence, focusing on intelligent agents, problem-solving techniques, and state-space search approaches.
2. Understand and apply various problem-solving and search techniques, including uniform and heuristic search strategies in artificial intelligence.
3. Explore and apply local search techniques for solving Constraint Satisfaction Problems (CSPs) and adversarial search strategies to make optimal decisions.
4. Apply various statistical reasoning techniques for knowledge representation and reasoning in AI, as well as logic programming and reasoning methods.
5. Familiar in fundamental concepts of Machine Learning techniques, as well as classification, regression, clustering problems, and an introduction to neural networks and deep learning.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

1. 1 Design intelligent agents, define problems using state-space models, and apply AI techniques.
2. Implement and compare different search algorithms (both uniform and heuristic), apply and analyze appropriate strategies for solving AI problems
3. Solve CSPs using local search methods and implement adversarial search algorithms to make optimal decisions in competitive game scenarios
4. Utilize statistical and logical reasoning methods, to represent knowledge and perform forward and backward reasoning in AI applications.
5. Understanding and apply various machine learning techniques, along with an introduction to neural networks and deep learning.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction to Artificial Intelligence and Problem-Solving Agent** | **8Hrs** |

Problems of AI, AI technique, Tic – Tac – Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents. Defining the problem as state space search, production system, problem characteristics, and issues in the design of search programs.

| | | |
|---|---|---|
| **Unit-II** | **Search Techniques** | **10Hrs** |

Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best -first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.

| | | |
|---|---|---|
| **Unit-III** | **Constraint Satisfaction Problems and Game Theory** | **8Hrs** |

Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha beta pruning, additional refinements, iterative deepening

| **Unit-IV** | **Knowledge & Reasoning: Statistical Reasoning** | **9Hrs** |
|---|---|---|

Probability and Bays' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. AI for knowledge representation, rule-based knowledge representation, procedural and declarative knowledge, programming, Forward and backward reasoning.

| **Unit-V** | **Introduction to Machine Learning** | **8Hrs** |
|---|---|---|

Exploring sub-discipline of AI: Machine Learning, Supervised learning, Unsupervised learning, Reinforcement learning, Classification problems, Regression problems, Clustering problems, Introduction to neural networks and deep learning.

**Text Books:**

1. S. Russell and P. Norvig, ―Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2015.
2. Nils J. Nilsson, ―Artificial Intelligence: A New Synthesis‖, 1st Edition, Morgan-Kaufmann, 1998.

**Reference Books:**

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, ―Artificial Intelligence‖, McGraw Hill, 3rd ed.,2017.
2. Patterson, ―Introduction to Artificial Intelligence & Expert Systems‖, Pearson, 1st ed. 2015.
3. Saroj Kaushik, ―Logic & Prolog Programming‖, New Age International, Ist edition, 2002.
4. Joseph C. Giarratano,Gary D. Riley, ―Expert Systems: Principles and Programming‖, 4th Edition, 2007.

**Web Resources:**

1. https://nptel.ac.in/courses/113104517
2. https://nptel.ac.in/courses/127104664
3. https://nptel.ac.in/courses/110104164
4. https://nptel.ac.in/courses/106106226

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## JAVA PROGRAMMING
(Common to all branches except CSE aligned )

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0545T | 3: 0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OEC |

**Course Objectives:**

This course will enable students:

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception
- handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java apis for program development

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.
- Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects
- Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.
- Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.
- Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.
- Choose appropriate data structure of Java to solve a problem

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | | **10Hrs** |

**Object Oriented Programming:** Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

**Data Types, Variables, and Operators :**Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final,

**Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator ( = ), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators. **Control Statements:** Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

| Unit-II | | 9Hrs |
|---|---|---|

**Classes and Objects:** Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this

**Methods:** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

| Unit-III | | 10Hrs |
|---|---|---|

**Arrays:** Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

**Inheritance:** Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

**Interfaces:** Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

| Unit-IV | | 9Hrs |
|---|---|---|

**Packages and Java Library** : Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java. lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto un boxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java. .Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

**Exception Handling:** Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throw able, Unchecked Exceptions, Checked Exceptions.

**Java I/O and File:** Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

| Unit-V | | 10Hrs |
|---|---|---|

**String Handling in Java:** Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

**Multithreaded Programming:** Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter thread Communication - Suspending, Resuming, and Stopping of Threads. Java Database Connectivity: Introduction, JDBC Architecture, Installing My SQL and My SQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface

**Java FX GUI:** Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

**Text Books:**

1. JAVA one step ahead, Anitha Seth, B.L. Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

**Reference Books:**

1. The complete Reference Java, 11thedition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

**Web References:**

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

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## FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

(Common to all branches except CSE aligned )

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0546T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | OEC |

**Course Objectives:**

This course will enable students to:

- To learn the distinction between optimal reasoning Vs. human like reasoning.
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
- Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
- Learn different knowledge representation techniques.
- Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
- Analyze Supervised Learning Vs. Learning Decision Trees

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | | **8Hrs** |

**Introduction to AI -** Intelligent Agents, Problem-Solving Agents, **Searching for Solutions** - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

| | | |
|---|---|---|
| **Unit-II** | | **10Hrs** |

**Games** - Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents,

**Logic-** Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

| | | |
|---|---|---|
| **Unit-III** | | **8Hrs** |

**First-Order Logic -** Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.

**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events

| **Unit-IV** | | **9Hrs** |
|---|---|---|

**Planning** - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

| **Unit-V** | | **8Hrs** |
|---|---|---|

**Probabilistic Reasoning:** Acting under Uncertainty, Basic Probability Notation Bayes‘ Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

**Text Books:**

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

**Reference Books:**

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

**Web References:**

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

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**QUANTUM TECHNOLOGIES AND APPLICATIONS**
(Common to all branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0547T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | OEC |

**Course Objectives:**

This course will enable students to:

- To introduce the fundamentals of quantum mechanics relevant to quantum technologies.
- To explain key quantum phenomena and their role in enabling novel technologies.
- To explore applications in quantum computing, communication, and sensing.
- To encourage understanding of emerging quantum-based technologies and innovations.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Understand key quantum mechanical concepts and phenomena.
- Comprehend the structure and function of quantum algorithms and circuits.
- Explore applications in quantum communication and cryptography.
- Appreciate the role of quantum technologies in modern engineering systems.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | Fundamentals of Quantum Mechanics | **8Hrs** |

- Classical vs Quantum Paradigm
- Postulates of Quantum Mechanics
- Wavefunction and Schrödinger Equation (Time-independent)
- Quantum states, Superposition, Qubits
- Measurement, Operators, and Observables
- Entanglement and Non-locality

| | | |
|---|---|---|
| **Unit-II** | Quantum Computing | **10Hrs** |

- Qubits and Bloch Sphere
- Quantum Logic Gates: Pauli, Hadamard, CNOT, and Universal Gates
- Quantum Circuits
- Basic Algorithms: Deutsch-Jozsa. Gover‘s, Shor‘s (conceptual)
- Error Correction and Decoherence

| | | |
|---|---|---|
| **Unit-III** | Quantum Communication and Cryptography | **8Hrs** |

- Teleportation & No-Cloning
- BB84 Protocol
- Quantum Networks & Repeaters
- Classical vs Quantum Cryptography
- Challenges in Implementation

| | | |
|---|---|---|
| **Unit-IV** | Quantum Sensors and Metrology | **9Hrs** |

- Quantum Sensing: Principles and Technologies
- Quantum-enhanced Measurements
- Atomic Clocks, Gravimeters
- Magnetometers, NV Centers
- Industrial Applications

| **Unit-V** | Quantum Materials and Emerging Technologies | **8Hrs** |
|---|---|---|
| • Quantum Materials: Superconductors, Topological Insulators<br>• Quantum Devices: Qubits, Josephson Junctions<br>• National Quantum Missions (India, EU, USA, China)<br>• Quantum Careers and Industry Initiatives | | |
| **Text Books:**<br>1. "Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang (Cambridge University Press)<br>2. "Quantum Mechanics: The Theoretical Minimum" by Leonard Susskind and Art Friedman (Basic Books) | | |
| **Reference Books:**<br>1. "Quantum Computing for Everyone" by Chris Bernhardt (MIT Press)<br>2. "Quantum Physics: A Beginner‘s Guide" by Alastair I.M. Rae<br>3. "An Introduction to Quantum Computing" by Phillip Kaye, Raymond Laflamme, and Michele Mosca<br>4. IBM Quantum Experience and Qiskit Documentation (https://qiskit.org/) | | |

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## FUNDAMENTALS OF OPERATING SYSTEMS

(Common to all branches except CSE aligned )

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| **23A0548T** | **3: 0:0:0** | **3** | **CIE:30 SEE:70** | **3 Hours** | **OEC** |

**Course Objectives:**

This course will enable students:

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**

- Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.
- Under stand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection.
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.
- Analyze the memory management and its allocation policies.
- Able to design and implement file systems, focusing on file access methods, directory structure, free space management, and also explore various protection mechanisms,

| **Syllabus** | | **Total Hours:48** |
|---|---|---|
| **Unit-I** | Operating Systems Overview, System Structures | **10Hrs** |

Computing environments, Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.

| | | |
|---|---|---|
| **Unit-II** | Process Concept, Multithreaded Programming, Process Scheduling, Inter-process Communication | **9Hrs** |

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples. Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

| | | |
|---|---|---|
| **Unit-III** | Memory-Management Strategies, Virtual Memory Management | **10Hrs** |

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples. Virtual Memory Management: Introduction, Demand paging, Copy on-write, 132 B.Tech - CSE R23 Regulation Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.

<table>
<tr><td>Unit-IV</td><td>Deadlocks, File Systems</td><td>9Hrs</td></tr>
<tr><td colspan="3">Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention. File Systems: Files, Directories, File system implementation, management and optimization. Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation</td></tr>
<tr><td>Unit-V</td><td>System Protection, System Security</td><td>10Hrs</td></tr>
<tr><td colspan="3">System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification. Case Studies: Linux, Microsoft Windows.</td></tr>
</table>

**Text Books:**

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Inter process Communication and File systems.)

**Reference Books:**

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

**Web References:**

1. https://nptel.ac.in/courses/106/106/106106144/ http://peterindia.net/OperatingSystems.html

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## MACHINE LEARNING
(Common to all branches except CSE aligned )

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0529T | 3: 0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OEC |

**Course Objectives:**

The course is introduced for students to
- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering

**Course Outcomes (CO):**

**On completion of this course, student will be able to:**
- CO1: Identify machine learning techniques suitable for a given problem.
- Solve real-world problems using various machine learning techniques.
- Apply Dimensionality reduction techniques for data preprocessing.
- Explain what is learning and why it is essential in the design of intelligent machines
- Evaluate Advanced learning models for language, vision, speech, decision making etc

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | | **10Hrs** |

Introduction to Machine Learning: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

| | | |
|---|---|---|
| **Unit-II** | | **9Hrs** |

Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

| | | |
|---|---|---|
| **Unit-III** | | **10Hrs** |

Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression. The Bayes Classifier: Introduction to the Bayes Classifier, Bayes‘ Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

| | | |
|---|---|---|
| **Unit-IV** | | **9Hrs** |

Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

| **Unit-V** | | **10Hrs** |
|---|---|---|

Clustering : Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering

**Text Books:**

4. Machine Learning Theory and Practice‖, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

**Reference Books:**

1. Machine Learning‖, Tom M. Mitchell, McGraw-Hill Publication, 2017
2. Machine Learning in Action‖,Peter Harrington, DreamTech
3. Introduction to Data Mining‖, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019

**Web Reference:**

1. https://onlinecourses.nptel.ac.in/noc20_cs29/preview
2. https://nptel.ac.in/courses/106106139

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**DATABASE MANAGEMENT SYSTEMS**
(Common to all branches except CSE aligned )

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0512T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | OEC |

**Course Objectives:**

This course will enable students to:

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

**Course Outcomes (CO):**

After completion of the course, students will be able to:

- Understand the basic concepts of database management systems
- Analyze a given database application scenario to use ER model for conceptual design of the database
- Utilize SQL proficiently to address diverse query challenges
- Employ normalization methods to enhance database structure
- Assess and implement transaction processing, concurrency control and database recovery protocols in databases.

**Syllabus**

| Unit-I | Introduction |
|---|---|

**Introduction:** Data base system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

**Entity Relationship Model:** Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams

| Unit-II | Relational Model: |
|---|---|

**Relational Model:** Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Data base schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

| Unit-III | SQL |
|---|---|

**SQL:** Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

| Unit-IV | Schema Refinement | |
|---|---|---|
| **Schema Refinement (Normalization):**Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce- Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF). | | |
| **Unit-V** | **Transaction Concept** | |
| **Transaction Concept:** Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. **Introduction to Indexing Techniques:** B+ Trees, operations on B+Trees, Hash Based Indexing: | | |

**Textbooks:**

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

**Reference Books:**

1. Introduction to Database Systems, 8thedition, C J Date, Pearson.
2. Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

**Web Resources:**

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

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## CYBER SECURITY

(Common to all branches except CSE aligned )

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0532Tb | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | OEC |

**Course Objectives:**

The course is designed to provide awareness on different cyber-crimes, cyber offenses, tools and methods used in cybercrime.

**Course Outcomes (CO):**

**After completion of the course, students will be able to**

- Classify the cybercrimes and understand the Indian ITA 2000
- Analyse the vulnerabilities in any computing system and find the solutions
- Predict the security threats of the future
- Investigate the protection mechanisms
- Design security solutions for organizations

| | Syllabus | Total Hours:42 |
|---|---|---|
| **Unit-I** | **Introduction to Cybercrime** | **8Hrs** |

**Introduction**, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

| | | |
|---|---|---|
| **Unit-II** | **Cyber Offenses: How Criminals Plan Them** | **9Hrs** |

**Introduction**, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

| | | |
|---|---|---|
| **Unit-III** | **Cybercrime: Mobile and Wireless Devices** | **9Hrs** |

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones,

Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

| | | |
|---|---|---|
| **Unit-IV** | **Tools and Methods Used in Cybercrime** | **8Hrs** |

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

| | | |
|---|---|---|
| **Unit-V** | **Cyber Security: Organizational Implications** | **8Hrs** |

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

**Text Books:**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

**Reference Books:**

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan- Hwa(john) Wu,J. David Irwin.CRC Press T&F Group

**Web Resources:**

1. http://nptel.ac.in/courses/106105031/40
2. http://nptel.ac.in/courses/106105031/39
3. http://nptel.ac.in/courses/106105031/38

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**COMPUTER NETWORKS & INTERNET PROTOCOLS**
(Common to all branches except CSE aligned )

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0520T | 3:0:0:0 | 3 | CIE: 30 SEE:70 | 3 Hours | OEC |

**Course Objectives:**

This course will enable students to:

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Identify the software and hardware components of a computer network
- Design software for a computer network
- Develop new routing, and congestion control algorithms
- Assess critically the existing routing protocols
- Explain the functionality of each layer of a computer network
- Choose the appropriate transport protocol based on the application requirements

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Computer Networks and the Internet** | **8Hrs** |
| What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks(Textbook 2), Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission (Textbook 1) | | |
| **Unit-II** | **The Data Link Layer, Access Networks, and LANs** | **10Hrs** |
| Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1)<br><br>Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2) | | |
| **Unit-III** | **The Network Layer** | **8Hrs** |
| Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1). | | |
| **Unit-IV** | **The Transport Layer** | **9Hrs** |
| Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1). | | |
| **Unit-V** | The Application Layer | **8Hrs** |
| Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet‘s Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks (Textbook 2). | | |

**Text Books:**

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 6th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, ―Computer Networking: A Top-Down Approach‖, 6th edition, Pearson, 2019.

**Reference Books:**

2. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
3. Youlu Zheng, Shakil Akthar, ―Networks for Computer Scientists and Engineers‖, Oxford Publishers, 2016.

**Web References:**

1. https://nptel.ac.in/courses/106105183/25
2. http://www.nptelvideos.in/2012/11/computer-networks.html
3. https://nptel.ac.in/courses/106105183/3

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## INTERNET OF THINGS
(Common to all branches except CSE aligned )

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A0450T | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OEC |

**Course Objectives:**

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology
- Introduce some of the application areas where IoT can be applied.
- Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Understand general concepts of Internet of Things.
- Apply design concept to IoT solutions
- Analyze various M2M and IoT architectures
- Evaluate design issues in IoT applications
- Create IoT solutions using sensors, actuators and Devices

| | Syllabus | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Introduction to IoT** | **9Hrs** |

Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates.

| | | |
|---|---|---|
| **Unit-II** | **Prototyping IoT Objects using Microprocessor/Microcontroller** | **9Hrs** |

Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

| | | |
|---|---|---|
| **Unit-III** | **IoT Architecture and Protocols** | **10Hrs** |

Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

| | | |
|---|---|---|
| **Unit-IV** | **Device Discovery and Cloud Services for IoT** | **10Hrs** |

Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

| | | |
|---|---|---|
| **Unit-V** | **UAV IoT** | **10Hrs** |

Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors;

UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

**Textbooks:**


1. Vijay Madisetti and Arshdeep Bahga, ― Internet of Things ( A Hands-on-Approach)‖, 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.


**Reference Books:**


1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, ―Rethinking the Internet of Things: A Scalable Approach to Connecting Everything‖, 1st Edition, Apress Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 9781-4493- 9357-
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal


**Web Resources:**

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

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## INTRODUCTION TO QUANTUM COMPUTING
(Common to all branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A3315a | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | OEC |

**Course Objectives:**

- To introduce the principles and mathematical foundations of quantum computation.
- To understand quantum gates, circuits, and computation models.
- To explore quantum algorithms and their advantages over classical ones.
- To develop the ability to simulate and write basic quantum programs.
- To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Explain the fundamental concepts of quantum mechanics used in computing.
- Construct and analyze quantum circuits using standard gates.
- Apply quantum algorithms like Deutsch-Jozsa, Grover‘s, and Shor‘s.
- Develop simple quantum programs using Qiskit or similar platforms.
- Analyze applications and challenges of quantum computing in real-world domains.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Fundamentals of Quantum Mechanics and Linear Algebra** | **9Hrs** |

Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems..

| | | |
|---|---|---|
| **Unit-II** | **Quantum Gates and Circuits** | **10Hrs** |

Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.

| | | |
|---|---|---|
| **Unit-III** | **Quantum Algorithms and Complexity** | **10Hrs** |

Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover‘s Search Algorithm, Shor‘s Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA

| | | |
|---|---|---|
| **Unit-IV** | **Quantum Programming and Simulation Platforms** | **10Hrs** |

Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware

| | | |
|---|---|---|
| **Unit-V** | **Applications and Future of Quantum Computing** | **9Hrs** |

Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.

**Textbooks:**

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

**Reference Books:**

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.

**Web Resources:**

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
3. edX – The Quantum Internet and Quantum Computers
4. YouTube – Quantum Computing for the Determined by Michael Nielsen
5. Qiskit Textbook – IBM Quantum

# RG 23

# CSE HONOR COURSES

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## COURSES OFFERED FOR HONOURS DEGREE IN CSE

| Sl. No. | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|
| | | | L | T | P | C |
| 1 | 23A3315a | Introduction to Quantum Computing | 3 | 0 | 0 | 3 |
| 2 | 23A05H01 | No SQL Databases | 3 | 0 | 0 | 3 |
| 3 | 23A05H02 | Software Defined Data Centre | 3 | 0 | 0 | 3 |
| 4 | 23A05H03 | Robotics and Intelligent Systems | 3 | 0 | 0 | 3 |
| 5 | 23A05H04 | Cloud Security | 3 | 0 | 0 | 3 |
| 6 | 23A05H05 | No SQL Lab | | | 3 | 1.5 |
| 7 | 23A05H06 | Quantum & Cloud Computing Lab | | | 3 | 1.5 |

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**INTRODUCTION TO QUANTUM COMPUTING**
(Common to all branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A3315a | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | HC |

**Course Objectives:**

- To introduce the principles and mathematical foundations of quantum computation.
- To understand quantum gates, circuits, and computation models.
- To explore quantum algorithms and their advantages over classical ones.
- To develop the ability to simulate and write basic quantum programs.
- To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Explain the fundamental concepts of quantum mechanics used in computing.
- Construct and analyze quantum circuits using standard gates.
- Apply quantum algorithms like Deutsch-Jozsa, Grover‘s, and Shor‘s.
- Develop simple quantum programs using Qiskit or similar platforms.
- Analyze applications and challenges of quantum computing in real-world domains.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit-I** | **Fundamentals of Quantum Mechanics and Linear Algebra** | **9Hrs** |
| Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.. | | |
| **Unit-II** | **Quantum Gates and Circuits** | **10Hrs** |
| Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits. | | |
| **Unit-III** | **Quantum Algorithms and Complexity** | **10Hrs** |
| Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover‘s Search Algorithm, Shor‘s Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA | | |
| **Unit-IV** | **Quantum Programming and Simulation Platforms** | **10Hrs** |
| Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware | | |
| **Unit-V** | **Applications and Future of Quantum Computing** | **9Hrs** |
| Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions. | | |

**Textbooks:**

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

**Reference Books:**

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.

**Web Resources:**

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
3. edX – The Quantum Internet and Quantum Computers
4. YouTube – Quantum Computing for the Determined by Michael Nielsen
5. Qiskit Textbook – IBM Quantum

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## No SQL DATABASES
(Common to all branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A05H01 | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | HC |

**Course Objectives:**

The course is introduced for students to

- Discuss the history unstructured data
- To know non- relational databases and their importance in Data science.
- Understand the differences between Relational and No SQL databases
- To explore the several types of No SQL data bases and understand the role in Big Data.

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Explain and compare different types of No SQL database.
- Compare and contrast RDBMS with different No SQL databases.
- Define, compare and use the four types of No SQL databases (Document-oriented, Key Value pairs, Column-oriented and Graph
- Demonstrate the architecture, define objects, load data, query data and performance tune Column-oriented, Key-Value pair,Document and Graph databases.
- Evaluate No SQL database development tools and programming languages

| Syllabus | | Total Hours: |
|---|---|---|
| **Unit-I** | **Overview and history of No SQL Data bases** | **12Hrs** |

Definition of the four types of No SQL data bases. The value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The emergence of No SQL, Key Points.

| | | |
|---|---|---|
| **Unit-II** | **RDBMS Vs No SQL** | **12Hrs** |

Comparison of relational databases to new No SQL stores, Mongo DB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges No SQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregated-Oriented Databases, Replication and Sharding, Map Reduce on databases, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

| | | |
|---|---|---|
| **Unit-III** | **Document Data bases** | **12Hrs** |

No-SQL Key-Value Databases using Mongo DB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analysis or Real Time Analytics.

| | | |
|---|---|---|
| **Unit-IV** | **Column Oriented Databases** | **12Hrs** |

Column-oriented No SQL databases using Apache HBASE, Column-oriented No SQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage. StudyHadoop benchmarking case Study

| **Unit-V** | **Key Value Data bases** | **12Hrs** |
|---|---|---|

No SQL Key-Value databases using Riak, Key-Value Data bases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets, Firebase- Cloud hosted No SQL Database, Graph No SQL databases using Neo4j, No SQL database development tools and programming languages, Graph Databases features, consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

**Text Books:**

1. Sadalage, P. & Fowler, No SQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition 2019.

**Reference Books:**

1. Redmond, E. & Wilson, J. (2012). Seven Databases in Seven Weeks: A Guide to Modern Databases and the No SQL Movement (1st Ed.). Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978-1934356920 ISBN-10: 1934356921
2. Guy Harrison, Next Generation Database: No SQL and big data, Apress.

**Web References:**

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa

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## SOFTWARE DEFINED DATA CENTER

(Common to all branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A05H02 | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | HC |

**Course Objectives:**

This course aim sat training students to master the:

- Introduce conventional Data Centers followed by Modern Data Centers
- To discuss various software elements of modern data centers
- Explain Virtualization concepts for Data Centers
- Discuss Compute, Storage and Network virtualization

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Understanding of difference between Conventional Data Center Vs Modern Data Centers
- Differentiate Cloud computing and Software Defined Data Centers
- Differentiate Virtualization with conventional techniques
- Explore the techniques of Software Defined Compute, Storage and Networking components
- Able Manage Software Defined Data Centers and Develop the techniques for future Data Centers.

| | Syllabus | Total Hours: |
|---|---|---|
| **Unit-I** | **Introduction** | **12Hrs** |

Data Center evolution, A history of Modern Data Center, Focus on cost reduction, Focus on Customer service in the business, Flattening of the IT organization, IT as an operational Expense, Monolithic Storage Array rise and fall, Move From Disk to Flash, Emergence of Convergence, The Role of Cloud computing.

| | | |
|---|---|---|
| **Unit-II** | **Emerging Data Center Trends** | **12Hrs** |

Emergence of SDCC, Commoditization of Hardware, Software Defined – Compute, Storage, Networking and Security, Software Defined Storage (SDS), Hyper convergence, Hyper Converged Infrastructure(HCI) and SDS relationship, Flash in Hyper convergence, Modern IT business Requirements.

| | | |
|---|---|---|
| **Unit-III** | **Data Center Agility** | **12Hrs** |

Principles and Strategies, Transform Data Center, Align Data Center and Business Needs, Server virtualization, VDI, Eliminate and Implement Monolithic to Hyper convergence, Full Stack Management.

| | | |
|---|---|---|
| **Unit-IV** | **Hyper converged Infrastructure** | **12Hrs** |

Software Defined Storage, SDS comparison to Traditional Storage, SDS requirements, SDS in Hyper converged, Hyper convergence Design Model, Virtual Storage appliances, Appliance vs. Software/Reference Architecture,

| | | |
|---|---|---|
| **Unit-V** | **Future Data Centers** | **12Hrs** |

Data growth, Storage capacity, flash storage deployment, Deployment Experiences SDS and HCI, IT transformations- Automation, Orchestration, DevOps, Open Standards and Interoperability, Performance Benchmarking Standards, Future Trends, Containers Instead of virtual machines, Open Source tools, Beyond Today's Flash, Pooling of Resources.

**Textbooks:**

1. Building a Modern Data Center, Principles and Strategies of Design, Scott D.Lowe, James Green, David Davis. Actual Tech Media, 2016.

**Reference Books:**

1. Data Center Handbook: Plan, Design, Build, and Operations of a Smart Data Center, Second Edition, HwaiyuGeng P.E.,2021 John Wiley & Sons.

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## ROBOTICS AND INTELLIGENT SYSTEMS
(Common to all branches)

| Course Code | L:T:P:C | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A05H03 | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | HC |

**Course Objectives:**

This course will enable students to:
- Understand the basic concepts of robotics.
- Discuss the requirement of robotic technology
- Introduce robotics kinematics, dynamic analysis and programming.
- Understand the concepts of intelligent system and apply them to robotics

**Course Outcomes (CO):**

**On completion of this course, student will be able to**
- Understand general concepts of Robotics and intelligent systems.
- Understand robotics control systems
- Analyze and understand the various programming languages of robotics
- Understand Industrial robots and its applications
- Create IoT solutions using sensors, actuators and Devices

| Syllabus | | Total Hours: |
|---|---|---|
| **Unit-I** | | **8Hrs** |

**Introduction to Robotics** :Back ground, Historical development, Robot Arm Kinematics and Dynamics, Manipulator Trajectory planning and Motion Control, Robot Sensing

| | | |
|---|---|---|
| **Unit-II** | | **9Hrs** |

**Robot Arm Kinematics and Dynamics:** Introduction to Kinematics, Direct and Inverse Kinematics Problem and solution, Dynamics introduction, Lagrange-Euler Formulation, Newton Euler Formation, Generalized D'Alembert Equations of motion. Trajectory planning,

| | | |
|---|---|---|
| **Unit-III** | | **9Hrs** |

**Sensing and Vision:** Introduction to Sensing, Proximity Sensing, Touch Sensors, Force and Torque Sensing, Image acquisition, Illumination techniques, Imaging Geometry, Recognition and Interpretation.

| | | |
|---|---|---|
| **Unit-IV** | | **8Hrs** |

**Robot Programming Languages:** Introduction to Robot Programming Languages, Characteristics of Robot Level Languages, three levels of robot programming, requirements of a robot programming language, Task Level Languages, problems peculiar to robot languages, Introduction to Robot Operating System (ROS)

| | | |
|---|---|---|
| **Unit-V** | | **8Hrs** |

**Robot Intelligence:** Introduction, State Space Search, Problem Reduction, Use of Predicate Logic, Means-Ends Analysis, Problem solving, Robot Learning, Robot Task Planning, Basic Problems in Task Planning, Expert systems and knowledge engineering.

**Text Books:**

1. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics : Control, Sensing, Vision and Intelligence
2. Aaron Martinez, Enrique Fernandez, Learning ROS for Robotics Programming: A practical, instructive, and comprehensive guide to introduce your self to ROS, the top-notch, leading robotics framework, PACKT publishing, Open Source.

**Reference Books:**

1. John J. Craig, Introduction to Robotics: Mechanics and Control, Addison Wesley publication, Third Edition.

**Web Resources:**

1. https://nptel.ac.in/courses/107106090
2. https://nptel.ac.in/courses/112108298

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## CLOUD SECURITY
(Common to all branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A05H04 | 3:0:0:0 | 3 | CIE:30 SEE:70 | 3 Hours | HC |

**Course Objectives:**

- Understand the cloud security and privacy issues.
- Familiarize with the Threat Model and Cloud Attacks.
- Understand the Data Security and Storage.
- Analyze Security Management in the Cloud

**Course Outcomes (CO):**

**After completion of the course, students will be able to**

- Distinguish the various cloud security and privacy issues.
- Analyze the various threats and Attack tools.
- Describe the Data Security and Storage.
- Analyze the Security Management in the Cloud

| | Syllabus | Total Hours: |
|---|---|---|
| **Unit-I** | **Over view of Cloud Computing** | **9Hrs** |

Overview of Cloud Computing: Introduction, Definitions and Characteristics, Cloud Service Models, Cloud Deployment Models, Cloud Service Platforms, Challenges Ahead. Introduction to Cloud Security: Introduction, Cloud Security Concepts, CSA Cloud Reference Model, NIST Cloud Reference Model, NIST Cloud Reference Model.

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| **Unit-II** | **Cloud Security and Privacy Issues** | **9Hrs** |

Cloud Security and Privacy Issues: Introduction, Cloud Security Goals/Concepts, Cloud Security Issues, Security Requirements for Privacy, Privacy Issues in Cloud. Infrastructure Security: The Network Level, the Host Level, the Application Level, SaaS Application Security, PaaS Application Security, IaaS Application Security.

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| **Unit-III** | **Threat Model and Cloud Attacks** | **9Hrs** |

Threat Model and Cloud Attacks: Introduction, Threat Model- Type of attack entities, Attack surfaces with attack scenarios, A Taxonomy of Attacks, Attack Tools-Network-level attack tools, VM-level attack tools, VMM attack tools, Security Tools, VMM security tools.

| | | |
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| **Unit-IV** | **Data Security and Storage** | **9Hrs** |

Information Security Basic Concepts, an Example of a Security Attack, Cloud Software Security Requirements, Rising Security Threats. Data Security and Storage: Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security.

| | | |
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| **Unit-V** | **Security Management in the Cloud** | **9Hrs** |

Evolution of Security Considerations, Security Concerns of Cloud Operating Models, Identity Authentication, Secure Transmissions, Secure Storage and Computation, Security Using Encryption Keys, Challenges of Using Standard Security Algorithms, Variations and Special Cases for Security Issues with Cloud Computing, Side Channel Security Attacks in the Cloud. Security Management in the Cloud- Security Management Standards, Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management.

**Text Books:**
1. Preeti Mishra, Emmanuel S Pilli, Jaipur R C Joshi Graphic Era., ―Cloud Security Attacks, Techniques, Tools, and Challenges‖, 1st Edition, 2022, CRC press.
2. Tim Mather, SubraKumaraswamy, and ShahedLati―Cloud Security and Privacy‖,1st Edition, 2019, O'Reilly Media, Inc.

**Reference Books:**
1. Naresh Kumar Sehgal Pramod Chandra, P. Bhatt John M. Acken., ―Cloud Computing with Security Concepts and Practices‖, 2nd Edition Springer nature Switzerland AG 2020.
2. Essentials of Cloud Computing by K. Chandrasekaran Special Indian Edition CRC press.
3. Raj kumar Buyya,―Cloud Computing Principles and Paradigms‖, John Wiley.

**Web Resources:**
1. https://onlinecourses.nptel.ac.in/noc19_cs64/preview
2. https://archive.nptel.ac.in/courses/106/105/106105167/

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**No SQL Lab**
(Common to all branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A05H05 | 0:0:0:3 | 1.5 | CIE:30 SEE:70 | 3 Hours | HC |

**Syllabus**

**List of experiments**

1. Mongo DB installation and configuration in windows.
2. Demon strate how to create and drop a database in Mongo DB.
3. Creating the Collection in Mongo DB on the fly
4. Creating collection with options before inserting the documents and drop the collection created.
5. Mongo DB insert document
   a. Insert single document
   b. Insert multiple documents in collection
6. Querying all the documents in json format and Querying based on the criteria.
7. Mongo DB update document
   a. Using update() method.
   b. Using save() method.
8. MongoDB delete document from a collection.
   a. Using remove() method.
   b. Remove only one document matching your criteria
   c. Remove all documents
9. Mongo DB Projection
10. limit() ,skip(), sort() methods in Mongo DB
11. Mongo DB indexing a. Create index in Mongo DB b. Finding the indexes in a collection c. Drop indexes in a collection d. Drop all the indexes
12. Mongo DB with java and PHP
    a. Create a simple application that uses Mongo DB with Java
    b. Create a simple application that uses Mongo DB with PHP

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## Quantum & Cloud Computing Lab
(Common to all branches)

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 23A05H05 | 0:0:0:3 | 1.5 | CIE:30 SEE:70 | 3 Hours | HC |

The objectives of the course are to

- Introduce fundamental quantum computing concepts such as qubits, superposition, and quantum gates using Qiskit.
- Develop an understanding of quantum algorithms through practical implementation, including Deutsch‘s algorithm.
- Provide hands-on experience in cloud computing by simulating cloud environments, VM allocation, and scheduling policies.
- Analyze cloud resource management techniques such as load balancing and deployment models.
- Explore cloud security challenges by simulating cyber threats like Denial of Service (DoS) attacks.

**Course Outcomes (CO):**

By the end of this course, students will be able to:

- Implement and compare classical and quantum bits using Qiskit.
- Design and analyze quantum circuits using logic gates and linear algebra principles.
- Simulate and evaluate cloud computing infrastructures including data centers, VM allocation, and scheduling policies.
- Apply resource provisioning techniques to optimize cloud performance and load balancing.
- Assess cloud security threats by implementing and analyzing DoS attack simulations.

**Quantum Syllabus**

**List of experiments**

1. Simulating Classical vs Quantum Bits
    - Implement classical bits and qubits using Qiskit.
    - Compare bit flip vs quantum superposition using Hadamard gates.
2. Quantum Logic Gates Implementation
    - Implement and visualize basic quantum gates (X, Y, Z, H, S, T).
    - Apply these gates to single and multiple qubits.
3. Linear Algebra in Quantum Computing
    - Represent quantum states using matrices and vectors.
    - Perform matrix operations (addition, multiplication, tensor product).
4. Deutsch’s Algorithm Implementation
    - Demonstrate quantum parallelism using Deutsch’s algorithm. Compare results with classical computation

**Cloud Computing Syllabus**

**List of experiments**

1. Simulation of a Simple Cloud Data Center: Create a cloud environment with multiple Hosts, Virtual Machines (VMs), and Cloudlets.
2. VM Allocation and Scheduling Policies: Implement and compare Time-Shared and Space-Shared VM allocation policies.

3. Resource Provisioning and Load Balancing : Simulate dynamic resource allocation for better load balancing.
4. Cloudlet Scheduling Algorithms: Implement and compare FCFS (First-Come-First Serve), Round Robin, and Priority-Based Scheduling.
5. Performance Analysis of Cloud Deployment Models : Simulate and compare Public, Private, Hybrid, and Community Cloud environments. 6. Simulating Denial of Service (DoS) Attacks: Implement a scenario where multiple requests overload a cloud server.

**TEXT BOKKS:**

1. Shashank Tiwari, Professional No SQL, Wrox Press, Wiley, 2011, ISBN: 978-0-470-94224-6
2. Pramod Sadalage and Martin Fowler, No SQL Distilled, Addison-Wesley Professional, 201

**Reference BOOKS:**

1. Dan McCreary and Ann Kelly, Making Sense of No SQL, Manning Publications, 2013.
2. 2. Gaurav Vaish, Getting Started with No SQL, Packt Publishing, 2013