# VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY

**(Autonomous)**

Thindal, Erode - 638 012

(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai)
(Accredited by NAAC with 'A+' grade)

## REGULATIONS 2022

## CURRICULUM AND SYLLABUS

# B.E. - CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

# VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY, ERODE-12.
# (AUTONOMOUS)
# DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

## VISION

To produce competent professionals in the field of Artificial Intelligence and Machine learning through effective teaching learning process and innovative research for the benefits of industries and society.

## MISSION

**M1:** To produce skilled and knowledgeable professionals in the field of Artificial Intelligence and Machine Learning through collaboration with industry.
**M2:** Providing exposure to advancements in Artificial Intelligence and Machine Learning using latest tools and technologies.
**M3:** Uplift innovative research in Artificial Intelligence and Machine Learning to serve the needs of society.
**M4:** To promote higher employability and entrepreneurial thinking with personal and professional responsibilities and commitment to lifelong learning.

## PROGRAM EDUCATIONAL OBJECTIVES

Our graduates after few years of graduation will:
PEO1. **Preparation**: Develop professional skills for a successful professional career as an engineer, scientist, technocrat, administrator or an entrepreneur.
PEO2. **Core Competence**: Design and implement practical systems consisting of software and/or hardware components through the key principles and practices of computation, mathematics and basic principles of engineering.
PEO3. **Multidisciplinary:** Design and apply new ideas and technologies as the field evolves, to solve real world problems in related interdisciplinary areas.
PEO4. **Professional Environment:** Demonstrate professional attitude and ethics, effective communication, team work and managerial skills for societal, environmental and global context.
PEO5. **Learning Environment:** Engage in continuing education and training and acquire professional competence through lifelong learning.

## PROGRAM OUTCOMES

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 analyse 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 for complex problems.
PO5: **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.



Chairperson - BoS
Dept. of CSE - VCET

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 lifelong learning in the broadest context of technological change.

**PROGRAM SPECIFIC OUTCOMES:**

**PSO1:** Ability to understand, apply and demonstrate the Artificial Intelligence and Machine Learning concepts and programming skills to solve the real world problems.

**PSO2:** Ability to contribute to problem identification, analysis, design, and development of systems using technologies and design principles of Artificial Intelligence and Machine Learning.

# Choice Based Credit System (CBCS)

| | |
|---|---|
| | **VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)** |
| Department | Computer Science and Engineering |
| Programme | B.E.- Computer Science and Engineering (AI and ML) |
| Regulations | 2022 |

**SUMMARY OF CREDITS**

| S.No | Course Category | Credits per Semester | | | | | | | | Total Credits | Credits in % | Credits as per AICTE Model Curriculum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | |
| 1 | HS | 4 | 4 | | | | | 4 | | 12 | 7.41 | 10 |
| 2 | BS | 11 | 8 | 4 | 4 | | | | | 27 | 16.67 | 16 |
| 3 | ES | 8 | 8 | 4 | | | 4 | | | 24 | 14.81 | 08 |
| 4 | PC | | | 12 | 20 | 13 | 8 | 4 | | 57 | 35.19 | 71 |
| 5 | PE | | | | | 6 | 6 | 6 | | 18 | 11.11 | 16 |
| 6 | OE | | | | | 3 | 3 | 3 | | 9 | 5.56 | 06 |
| 7 | EC | | | | | | 3 | | 12 | 15 | 9.26 | 38 |
| 8 | MC | ✓ | | | | | | | | | | - |
| 9 | VC | ✓ | | | | | | | | | | - |
| 10 | OC, SC, AC | ✓ | | | | | | | | | | - |
| **Total Credits / Sem** | | **23** | **20** | **20** | **24** | **22** | **24** | **17** | **12** | **162** | **100.00** | - |

HS - Humanities and Social Science
BS - Basic Science
ES - Engineering Science
PC - Professional Core
PE - Professional Elective
OE - Open Elective
EC - Employability Enhancement Course (Project, Seminar, Internship, etc.)
MC - Mandatory Course
VC - Value added course (If three or more credits earned, then one elective course may be exempted)
OC - Online Course (If six or more credits earned, then two elective courses may be exempted)
SC - Self Study course
AC - Audit Course

## ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For Minor Degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.



Chairperson - BoS
Dept. of CSE - VCET

| | VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous) | CURRICULUM |
|---|---|---|
| | | UG |
| Department | Computer Science and Engineering | R – 2022 Incorporating Relative Grading System |
| Programme | B.E.- Computer Science and Engineering (AI and ML) | |

| SEMESTER 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | C | SE | Tot. |
| 1 | 22MCT01 | Induction Programme | MC | 2 WEEKS | | | 0 | - | - | - |
| **Theory** | | | | | | | | | | |
| 2 | 22ENT11 | Communicative English | HS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22MAT12 | Matrices and Differential Calculus | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 4 | 22PHT11 | Engineering Physics | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22CYT11 | Engineering Chemistry | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22CST11 | Python Programming | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22MET11 | Engineering Graphics | ES | 2 | 0 | 4 | 4 | 40 | 60 | 100 |
| 8 | 22HST11 | தமிழர் மரபு / Heritage of Tamil | HS | 1 | 0 | 0 | 1 | 40 | 60 | 100 |
| **Practical** | | | | | | | | | | |
| 9 | 22PHL11 | Physics and Chemistry Laboratory I | BS | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| 10 | 22CSL11 | Python Programming Laboratory (For Students admitted in AY:2023-2024 only) | ES | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| 10a | 22CSL11 | Python Programming Laboratory (For Students admitted from AY:2024-2025 onwards) | ES | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| **Mandatory** | | | | | | | | | | |
| 11 | 22MCT02 | Universal Human Values | MC | 0 | 0 | 2 | 0 | 100 | 0 | 100 |
| | | | | | | **Total Credits** | 23 | | | |



Chairperson - BoS
Dept. of CSE - VCET

| SEMESTER 2 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| S. No | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| **Theory** | | | | | | | | | | |
| 1 | 22ENT21 | Professional English | HS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22MAT22 | Probability and Statistics | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 3 | 22PHT22 | Physics for Information Sciences | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22EET11 | Basics of Electrical and Electronics Engineering | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22ITT21 | C Programming | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22HST21 | தமிழரும் தொழில்நுட்பமும் / Tamils and Technology | HS | 1 | 0 | 0 | 1 | 40 | 60 | 100 |
| **Practical** | | | | | | | | | | |
| 8 | 22PHL21 | Physics And Chemistry Laboratory II | BS | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| 9 | 22ITL21 | C Programming Laboratory | ES | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| 10 | 22EEL22 | Engineering Practices Laboratory | ES | 0 | 0 | 2 | 1 | 100 | 0 | 100 |
| **Mandatory** | | | | | | | | | | |
| 11 | 22MCT03 | Environmental Science and Engineering | MC | 2 | 0 | 0 | 0 | 100 | 0 | 100 |
| **Total Credits** | | | | | | | 20 | | | |

Chairperson - BoS
Dept. of CSE - VCET

| SEMESTER 3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| S. No | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| **Theory** | | | | | | | | | | |
| 1 | 22MAT34 | Discrete Mathematics | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | 22AMT31 | Artificial Intelligence | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22AMC31 | Data Structures | PC | 3 | 0 | 2 | 4 | 50 | 50 | 100 |
| 4 | 22AMT32 | Object Oriented Programming | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22AMC32 | Digital Design and Computer Organization | ES | 3 | 0 | 2 | 4 | 50 | 50 | 100 |
| **Practical** | | | | | | | | | | |
| 6 | 22AML31 | Artificial Intelligence Laboratory | PC | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| 7 | 22AML32 | Object Oriented Programming Laboratory | PC | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| **Mandatory** | | | | | | | | | | |
| 8 | 22MCL04 | English for Professionals | MC | 0 | 0 | 2 | 0 | 100 | 0 | 100 |
| | | | | | | | **Total Credits** | 20 | | |

| SEMESTER 4 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| S. No | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| **Theory** | | | | | | | | | | |
| 1 | 22MAT42 | Optimization Techniques and Queuing Theory | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | 22AMC41 | Database Management Systems | PC | 3 | 0 | 2 | 4 | 50 | 50 | 100 |
| 3 | 22AMT41 | Design and Analysis of Algorithms | PC | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 4 | 22AMC42 | Operating Systems | PC | 3 | 0 | 2 | 4 | 50 | 50 | 100 |
| 5 | 22AMT42 | Foundations of Data Science | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22AMT43 | Machine Learning | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **Practical** | | | | | | | | | | |
| 7 | 22AML41 | Data Science Laboratory | PC | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| 8 | 22AML42 | Machine Learning Laboratory | PC | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| | | | | | | | **Total Credits** | 24 | | |

Chairperson - BoS
Dept. of CSE - VCET

| SEMESTER 5 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| S. No | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| **Theory** | | | | | | | | | | |
| 1 | 22AMT51 | Object Oriented Software Engineering | PC | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | 22AMT52 | Theory of Computation | PC | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 3 | 22AMT53 | Deep Learning | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | | Professional Elective - 1 | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | | Professional Elective - 2 | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | | Open Elective - 1 | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **Practical** | | | | | | | | | | |
| 7 | 22AML51 | Data Visualization Laboratory | PC | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| 8 | 22AML52 | Deep Learning Laboratory | PC | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| **Mandatory** | | | | | | | | | | |
| 9 | 22MCT05 | Aptitude and Logical Reasoning | MC | 2 | 0 | 0 | 0 | 100 | 0 | 100 |
| 10 | 22MCL06 | Communication Skills Laboratory | MC | 0 | 0 | 2 | 0 | 100 | 0 | 100 |
| **Total Credits** | | | | | | | 22 | | | |

| SEMESTER 6 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| S. No | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| **Theory** | | | | | | | | | | |
| 1 | 22AMC61 | Embedded Systems and Internet of Things | ES | 3 | 0 | 2 | 4 | 50 | 50 | 100 |
| 2 | 22AMT61 | Natural Language Processing | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22AMT62 | Big Data Analytics | PC | 3 | 0 | 2 | 4 | 40 | 60 | 100 |
| 4 | | Professional Elective - 2 | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | | Professional Elective - 3 | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | | Open Elective - 2 | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **Practical** | | | | | | | | | | |
| 9 | 22AML61 | Natural Language Processing Laboratory | PC | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| 10 | 22AML62 | Mini Project | EC | 0 | 0 | 6 | 3 | 40 | 60 | 100 |
| **Total Credits** | | | | | | | 24 | | | |

Chairperson - BoS
Dept. of CSE - VCET

| SEMESTER 7 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| S. No | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| **Theory** | | | | | | | | | | |
| 1 | 22AMT71 | Economics and Management for Engineers | HS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22AMT72 | Cryptography and Cyber Security | PC | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| 3 | | Professional Elective - 5 | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | | Professional Elective - 6 | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | | Open Elective - 3 | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22HST71 | Human Values and Professional Ethics | HS | 1 | 0 | 0 | 1 | 40 | 60 | 100 |
| **Practical** | | | | | | | | | | |
| 7 | 22AML71 | Security Laboratory | PC | 0 | 0 | 2 | 1 | 60 | 40 | 100 |
| **Mandatory** | | | | | | | | | | |
| 8 | 22MCT07 | Indian Constitution and Traditional Knowledge | MC | 2 | 0 | 0 | 0 | 100 | 0 | 100 |
| | | | | | | **Total Credits** | 17 | | | |

| SEMESTER 8 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| S. No | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| **Practical** | | | | | | | | | | |
| 1 | 22AML81 | Internship | EC | - | - | - | 2 | 100 | 0 | 100 |
| 2 | 22AML82 | Project Work | EC | 0 | 0 | 20 | 10 | 40 | 60 | 100 |
| | | | | | | **Total Credits** | 12 | | | |
| | | | | | | **Total Programme Credits** | 162 | | | |

Chairperson - BoS
Dept. of CSE - VCET

# PROFESSIONAL ELECTIVE COURSES: VERTICALS

| Vertical I Data Science | Vertical II Full Stack Development | Vertical III Cloud Computing and Data Processing Technologies | Vertical IV Emerging Technologies | Vertical V Artificial Intelligence and Machine Learning | Vertical VI Networking and Cyber Security |
|---|---|---|---|---|---|
| Exploratory Data Analysis | Cloud Computing | Cloud Computing | Augmented Reality / Virtual Reality | Cognitive Science and Analytics | Mobile Communication |
| Text and Speech Analytics | Web Programming | Distributed Computing | Human Computer Interaction | Neural Networks and Deep Learning | Distributed Computing |
| Social Network Analysis | NoSQL Database | Edge and Fog Computing | Brain Computer Interface | Soft Computing | Ad-hoc and Wireless Sensors Networks |
| Information Retrieval | Service Oriented Architecture | Security and Privacy in cloud | Robotics | Computer Vision | Ethical Hacking |
| Data Warehousing and Data Mining | UI/UX Design | Devops and Site Reliability Engineering | Fintech and Block chain Technologies | Tiny ML | Security and Privacy in Cloud |
| Business Intelligence | Devops | Poly Cloud | Game Development | Auto ML | Software Defined Networks |
| Image and Video Analytics | Software Testing and Automation | Information Storage Management | 3D Printing and Design | ML Operating Systems | Information Security |
| Recommender Systems | Programming with JavaScript | Virtualization | Generative AI | Ethics & AI | Cyber Forensics |

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

Professional Elective Courses will be registered in Semesters V to VII. These courses are listed in groups called verticals that represent a particular area of specialisation / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI & VII.

The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E / B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2022.



Chairperson - BoS
Dept. of CSE - VCET

| PROFESSIONAL ELECTIVE COURSES: VERTICALS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| **Vertical I : Verticals for Data Science** | | | | | | | | | | |
| 1 | 22AME11 | Exploratory Data Analysis | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22AME12 | Text and Speech Analytics | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22AME13 | Social Network Analysis | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22AME14 | Information Retrieval | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22AME15 | Data Warehousing and Data Mining | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22AME16 | Business Intelligence | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22AME17 | Image and Video Analytics | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 8 | 22AME18 | Recommender Systems | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **Vertical II : Verticals for Full Stack Development** | | | | | | | | | | |
| 1 | 22AME21 | Cloud Computing | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22AME22 | Web Programming | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22AME23 | NoSQL Database | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22AME24 | Service Oriented Architecture | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22AME25 | UI/UX Design | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22AME26 | Devops | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22AME27 | Software Testing and Automation | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 8 | 22AME28 | Programming with JavaScript | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **Vertical III : Verticals for Cloud Computing and Data Processing Technologies** | | | | | | | | | | |
| 1 | 22AME21 | Cloud Computing | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22AME31 | Distributed Computing | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22AME32 | Edge and Fog Computing | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22AME33 | Security and Privacy in cloud | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22AME34 | Devops and Site Reliability Engineering | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22AME35 | Poly Cloud | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22AME36 | Information Storage Management | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 8 | 22AME37 | Virtualization | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |



Chairperson - BoS
Dept. of CSE - VCET

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Vertical IV : Verticals for Emerging Technologies** | | | | | | | | | | |
| 1 | 22AME41 | Augmented Reality / Virtual Reality | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22AME42 | Human Computer Interaction | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22AME43 | Brain Computer Interface | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22AME44 | Robotics | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22AME45 | Fintech and Block chain Technologies | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22AME46 | Game Development | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22AME47 | 3D Printing and Design | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 8 | 22AME48 | Generative AI | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **Vertical V : Verticals for Artificial Intelligence and Machine Learning** | | | | | | | | | | |
| 1 | 22AME51 | Cognitive Science and Analytics | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22AME52 | Neural Networks and Deep Learning | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22AME53 | Soft Computing | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22AME54 | Computer Vision | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22AME55 | Tiny ML | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22AME56 | Auto ML | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22AME57 | ML Operating Systems | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 8 | 22AME58 | Ethics & AI | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **Vertical VI : Verticals for Networking and Cyber Security** | | | | | | | | | | |
| 1 | 22AME61 | Mobile Communication | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22AME31 | Distributed Computing | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22AME63 | Ad-hoc and Wireless Sensors Networks | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22AME64 | Ethical Hacking | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22AME33 | Security and Privacy in Cloud | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22AME65 | Software Defined Networks | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22AME66 | Information Security | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 8 | 22AME67 | Cyber Forensics | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |



Chairperson - BoS
Dept. of CSE - VCET

| OPEN ELECTIVES | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| **OFFERED BY DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING** | | | | | | | | | | |
| 1 | 22AMO01 | AI for Everyone | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22AMO02 | Machine Learning and its Applications | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22AMO03 | Design Thinking | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22AMO04 | Neural Networks | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22AMO05 | Digital Marketing | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **OFFERED BY DEPARTMENT OF BIO MEDICAL ENGINEERING** | | | | | | | | | | |
| 1 | 22BMO01 | Biometric systems and their applications | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22BMO02 | Healthcare Management Systems | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22BMO03 | Basics of Bioinformatics | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22BMO04 | Biology for Engineers | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22BMO05 | Regulatory requirements in Pharmaceutical Industries | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22BMO06 | Rapid Prototyping | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22BMO07 | Radiotherapy basics and Applications | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 8 | 22BMO08 | Nanotechnology and Applications | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **OFFERED BY DEPARTMENT OF CIVIL ENGINEERING** | | | | | | | | | | |
| 1 | 22CEO01 | Civil and Infrastructure Engineering | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22CEO02 | Environmental Pollution and WasteManagement | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22CEO03 | Disaster Management and Mitigation | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22CEO04 | Building Services | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **OFFERED BY DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING** | | | | | | | | | | |
| 1 | 22CSO01 | Foundation of AR and VR | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22CSO02 | Web Designing | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22CSO03 | Block Chain fundamentals | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22CSO04 | Knowledge Management | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22CSO05 | Cloud Computing Essentials | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |



Chairperson - BoS
Dept. of CSE - VCET

| OFFERED BY DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 22ECO01 | Consumer Electronics | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22ECO02 | Advanced Mobile Communication | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22ECO03 | Optoelectronics | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22ECO04 | IOT System Design and Applications | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22ECO05 | 5G Technologies | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| OFFERED BY DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING | | | | | | | | | | |
| 1 | 22EEO01 | Domestic and Industrial Electrical Installations | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22EEO02 | Renewable Energy Sources | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22EEO03 | Electric Vehicles | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22EEO04 | Energy Auditing and Conservation | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING | | | | | | | | | | |
| 1 | 22MEO01 | Industrial Instrumentation | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22MEO02 | Product Design and Development | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22MEO03 | Sustainable Manufacturing | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22MEO04 | Entrepreneurship Development | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22MEO05 | Fundamentals of Ergonomics | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22MEO06 | Principles of Management and Industrial Psychology | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22MEO07 | Safety Measures for Engineers | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| OFFERED BY DEPARTMENT OF MEDICAL ELECTRONICS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 22MDO01 | Introduction To Medical Electronics | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22MDO02 | Hospital Waste Management | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22MDO03 | Hospital Information System | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22MDO04 | IoT Applications in Healthcare | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| OFFERED BY DEPARTMENT OF INFORMATION TECHNOLOGY | | | | | | | | | | |
| 1 | 22ITO01 | Basics of Java Programming | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22ITO02 | Ethical Hacking | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22ITO03 | E-Commerce and Applications | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22ITO04 | Basics of Android Application Development | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22ITO05 | Web Essentials | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22ITO06 | Digital Video Editing | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| OFFERED BY DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE | | | | | | | | | | |
| 1 | 22ADO01 | Fundamentals of Database | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22ADO02 | Data Science for Engineers | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22ADO03 | Cyber Security | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22ADO04 | Data Visualization | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22ADO05 | Business Analytics | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| OFFERED BY DEPARTMENT OF SCIENCE AND HUMANITIES | | | | | | | | | | |
| 1 | 22GEO01 | National Cadet Corps Studies – I | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22GEO02 | National Cadet Corps Studies – II | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |



Chairperson - BoS
Dept. of CSE - VCET

## ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also

### VERTICALS FOR MINOR DEGREE

**(In addition to all the verticals of other programmes)**

| **Vertical I Fintech and Block Chain** | **Vertical II Entrepreneurship** | **Vertical III Public Administration** | **Vertical IV Business Data Analytics** | **Vertical V Environmental and Sustainability** | **Vertical VI Artificial Intelligence** |
|---|---|---|---|---|---|
| Financial Management | Foundations of Entrepreneurship | Principles of Public Administration | Statistics for Management | Sustainable infrastructure Development | Introduction to Data Science |
| Fundamental sof Investment | Team Building & Leadership Management for Business | Constitution of India | Data mining for Business Intelligence | Sustainable Agriculture and Environmental Management | Principles of Artificial Intelligence |
| Banking, Financial Services and Insurance | Creativity & Innovation in Entrepreneurship | Public Personnel Administration | Human Resource Analytics | Sustainable Bio Materials | Data Warehousing and Data Mining |
| Introduction to Blockchain and its Applications | Principles of Marketing Management For Business | Administrative Theories | Digital Marketing and Social Network Analytics | Materials for Energy Sustainability | Machine Learning Techniques |
| Fintech Personal Finance and Payments | Human Resource Management for Entrepreneurs | Indian Administrative System | Supply Chain Analytics | Green Technology | Expert Systems |
| Introduction to Fintech | Financing New Business Ventures | Public Policy Administration | Financial Analytics | Environmental Quality Monitoring and Analysis | Cognitive Science |
| - | - | - | - | Integrated Energy Planning for Sustainable Development | Gamification |
| - | - | - | - | Energy Efficiency for Sustainable Development | - |



Chairperson - BoS
Dept. of CSE - VCET

| MINOR DEGREE COURSES: VERTICALS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Hours / Week | | | Credits | Max. Marks | | |
| | | | L | T | P | | CA | SE | Tot. |
| **VERTICAL I- FINTECH AND BLOCK CHAIN** | | | | | | | | | |
| 1 | 22ITM11 | Financial Management | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22ITM12 | Fundamentals of Investment | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22ITM13 | Banking, Financial Services and Insurance | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22ITM14 | Introduction to Blockchain and its Applications | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22ITM15 | Fintech Personal Finance and Payments | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22ITM16 | Introduction to Fintech | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **VERTICAL II - ENTREPRENEURSHIP** | | | | | | | | | |
| 1 | 22MEM21 | Foundations of Entrepreneurship | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22MEM22 | Team Building & Leadership Management for Business | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22MEM23 | Creativity & Innovation in Entrepreneurship | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22MEM24 | Principles of Marketing Management for Business | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22MEM25 | Human Resource Management for Entrepreneurs | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22MEM26 | Financing New Business Ventures | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **VERTICAL III – PUBLIC ADMINISTRATION** | | | | | | | | | |
| 1 | 22ECM31 | Principles of Public Administration | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22ECM32 | Constitution of India | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22ECM33 | Public Personnel Administration | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22ECM34 | Administrative Theories | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22ECM35 | Indian Administrative System | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22ECM36 | Public Policy Administration | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **VERTICAL IV - BUSINESS DATA ANALYTICS** | | | | | | | | | |
| 1 | 22CSM41 | Statistics for Management | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22CSM42 | Data mining for Business Intelligence | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22CSM43 | Human Resource Analytics | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22CSM44 | Digital Marketing and Social Network Analytics | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22CSM45 | Supply Chain Analytics | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22CSM46 | Financial Analytics | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **VERTICAL V - ENVIRONMENTAL AND SUSTAINABILITY** | | | | | | | | | |
| 1 | 22CEM51 | Sustainable infrastructure Development | 3 | 0 | 0 | 3 | 40 | 60 | 100 |



Chairperson - BoS
Dept. of CSE - VCET

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 22CEM52 | Sustainable Agriculture and Environmental Management | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22CEM53 | Sustainable BioMaterials | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22CEM54 | Materials for Energy Sustainability | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22CEM55 | Green Technology | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22CEM56 | Environmental Quality Monitoring and Analysis | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22CEM57 | Integrated Energy Planning for Sustainable Development | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 8 | 22CEM58 | Energy Efficiency for Sustainable Development | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **VERTICAL VI - ARTIFICIAL INTELLIGENCE** | | | | | | | | | |
| 1 | 22ADM61 | Introduction to Data Science | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 22ADM62 | Principles of Artificial Intelligence | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 22ADM63 | Data Warehousing and Data Mining | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 22ADM64 | Machine Learning Techniques | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 22ADM65 | Expert Systems | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | 22ADM66 | Cognitive Science | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | 22ADM67 | Gamification | 3 | 0 | 0 | 3 | 40 | 60 | 100 |



Chairperson - BoS
Dept. of CSE - VCET

| VALUE ADDED COURSES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| S. No | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| 1 | 22CSV01 | R Programming | VAC | 0 | 0 | 2 | 1 | 100 | 0 | 100 |
| 2 | 22CSV02 | Network Essentials | VAC | 0 | 0 | 2 | 1 | 100 | 0 | 100 |
| 3 | 22CSV03 | Type Script | VAC | 0 | 0 | 2 | 1 | 100 | 0 | 100 |
| 4 | 22CSV04 | REST API | VAC | 0 | 0 | 2 | 1 | 100 | 0 | 100 |
| 5 | 22CSV05 | Prompt Engineering | VAC | 0 | 0 | 2 | 1 | 100 | 0 | 100 |
| 6 | 22CSV06 | Power BI | VAC | 0 | 0 | 2 | 1 | 100 | 0 | 100 |

| MANDATORY COURSES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Category | Periods / Week | | | Credits | Max. Marks | | |
| | | | | L | T | P | | CA | SE | Tot. |
| 1 | 22MCT01 | Induction Programme | MC | - | - | - | - | - | - | 100 |
| 2 | 22MCT02 | Universal Human Values - I | MC | 1 | 0 | 2 | 0 | 100 | 0 | 100 |
| 3 | 22MCT03 | Environmental Science and Engineering | MC | 2 | 0 | 0 | 0 | 100 | 0 | 100 |
| 4 | 22MCL04 | English for Professionals | MC | 0 | 0 | 2 | 0 | 100 | 0 | 100 |
| 5 | 22MCT05 | Aptitude and Logical Reasoning | MC | 2 | 0 | 0 | 0 | 100 | 0 | 100 |
| 6 | 22MCL06 | Communication Skills Laboratory | MC | 0 | 0 | 2 | 0 | 100 | 0 | 100 |
| 7 | 22MCT07 | Indian Constitution and Traditional Knowledge | MC | 2 | 0 | 0 | 0 | 100 | 0 | 100 |

L - Lecture Period
T - Tutorial Period
P - Practical Period

CA - Continuous Assessment
SE - Semester Examination
Tot - Total Marks

| Category | Credits | Minimum contact periods per week | 1 Period = 50 Minutes duration |
|---|---|---|---|
| Theory | 3 | 4 | |
| | 4 | 5 | |
| Practical | 1 | 3 | |

Chairperson - BoS
Dept. of CSE - VCET

| 22MCT01 | INDUCTION PROGRAMME<br>(Common to all B.E, B.Tech Programmes) | L | T | P | C |
|---|---|---|---|---|---|
| | | - | - | - | 0 |

**Preamble:**

*This is a mandatory 2 week programme to be conducted as soon as the students enter theinstitution. Normal classes start only after the induction program is over.*

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department ofadmission, have a holistic outlook, and have a desire to work for national needs and beyond. Thegraduating student must have knowledge and skills in the area of his/her study. However, he/shemust also have broad understanding of society and relationships. Character needs to be nurturedas an essential quality by which he/she would understand and fulfill his/her responsibility as anengineer, a citizen and a human being. Besides the above, several meta-skills and underlyingvalues are needed."

"One will have to work closely with the newly joined students in making them feel comfortable,allow them to explore their academic interests and activities, reduce competition and make themwork for excellence, promote bonding within them, build relations between teachers and students,give a broader view of life, and build character. "Hence, the purpose of this programme is to make the students feel comfortable in their newenvironment, open them up, set a healthy daily routine, create bonding in the batch as well asbetween faculty and students, develop awareness, sensitivity and understanding of the self, peoplearound them, society at large, and nature.

**The following are the activities under the induction program in which the student would be fullyengaged throughout the day for the entire duration of the program:**

**(i) Physical Activity**

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

**(ii) Creative Arts**

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

**(iii)Universal Human Values**

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. Discussions would be



Chairperson - BoS

conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

**(iv)Literary Activity**

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

**(v) Proficiency Modules**

This would address some lacunas that students might have, for example, English, computer familiarity etc.

**(vi)Lectures by Eminent People**

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

**(vii) Visits to Local Area**

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

**(viii) Familiarization to Dept./Branch & Innovations**

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

**(ix)Department Specific Activities**

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering /Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

**Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.**

**References:**

- Guide to Induction program from AICTE

Chairperson - BoS
Dept. of CSE - VCET

22ENT11

# COMMUNICATIVE ENGLISH

*(Common to all B.E./B. Tech Programmes)*
*(Students admitted during 2023- 24 onwards)*

L T P C
3 0 0 3

**Preamble :**

*Communicative English is a life skill necessary for all students of Engineering and Technology. The course Communicative English aims at developing Communication Skills in English which is essential for the learner to handle English language for a variety of everyday purposes through acquisition of basic grammar and vocabulary along with LSRW skills.*

**UNIT 1 INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION** 9

**Listening:** Listening for General Information - Specific Details – Conversations - Telephone Conversation - Listening to Voicemail and Messages – Gap Filling **Speaking**: Self Introduction – Expressing Opinions - Introducing a Friend - Telephone Conversation - Leave a Message - **Reading:** Reading Brochures and Pamphlets **Writing:** Writing Reviews - Book/Movie – Writing about Oneself **Grammar & Vocabulary:** Parts of Speech - Tenses - Contextual Meaning of Words - Abbreviations and Acronyms.

**UNIT 2 EXPRESSING CASUAL CONVERSATIONS** 9

**Listening:** Information about Hotels and Accommodation - Recipes and Food Items - Listening to Conversations Asking for and Giving Directions – Making an Enquiry **Speaking:** Talking about Daily Routine - Talking about Food - Making Conversation using Asking for and Giving Directions - Making an Enquiry - Role Plays - Dialogues **Reading**: International Recipes - Reading a Print Interview and Answering Comprehension Questions **Writing**: E- Mail to a Friend – E-Mails about Food and Recipes, Inviting Dignitaries, Accepting and Declining Invitations **Grammar & Vocabulary**: Evaluations and Comparisons with Adjectives - Word Formation.

**UNIT 3 CLARIFICATIONS AND RECOMMENDATIONS** 9

**Listening:** Listening to Short Talks and Fill a table – Gap Filling Exercises - Note Taking **Speaking:** Group Discussion - Agreeing and Disagreeing - Tips and Strategies for GD **Reading:** Articles - Essays drawn from various sources - Note Making **Writing:** Writing Recommendations - Giving Instructions – Itinerary - Process Description **Grammar & Vocabulary**: Prepositions - Modifiers - Phrasal Verbs.

**UNIT 4 PUBLIC SPEAKING AND BUSINESS COMMUNICATION** 9

**Listening:** Listening to Speeches by Famous People and Identifying the Central Message of the Speech - Answering Multiple Choice Questions **Speaking**: Welcome Address - Vote of Thanks - Special Address on Specific Topic **Reading**: Life and Achievements of Famous People **Writing:** Checklists – Personal Letters **Grammar & Vocabulary**: Modal Verbs and Probability - Collocations – Fixed Expressions - Semi-Fixed Expressions.

**UNIT 5 WRITING DEFINITIONS AND PRODUCT DESCRIPTIONS** 9

**Listening**: Listening to Product Description - Labeling and Gap Filling Exercises - Seeking help with Office Equipment - Job Details **Speaking:** Describe a Product - Compare and Contrast with other Products - Buying a Product - Selling a Product - Cancelling and Fixing Appointments - Hotel Accommodation **Reading:** Reading Graphical Material for Comparison - Tables - Pie Charts **Writing:** Writing Definitions – Single Line Definition and Extended Definition - Compare and Contrast Paragraphs - Clarifying an Error in the Bill **Grammar & Vocabulary**: Types of Questions - Use of Discourse Markers – One Word Substitution.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Richards, Jack. C with Jonathan Hull and Susan Proctor New Interchange: English for International Communication. (Level 1, Student's Book) Cambridge University Press, New Delhi: 2017.


**REFERENCES:**


1. M Ashraf Rizvi, "Effective Technical Communication", McGraw-Hill, 2nd Edition, New Delhi, 2018.
2. Sanjay Kumar and Pushp Lata, "Communication Skills: A Workbook, Oxford University Press, 2020.
3. J K Gangal, "A Practical course in Spoken English", PHI Learning Pvt. Ltd., 1st Edition, Delhi, 2014.




Chairperson - BoS
Dept. of English - VCET

Chairperson - BoS
Dept. of CSE - VCET

**e. RESOURCES :**

1. https://learnenglish.britishcouncil.org
2. https://www.usingenglish.com

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Converse and read fluently using basic grammar components.
**CO2** Communicate through writing without any grammatical errors.
**CO3** Write clear, coherent and organized passages adhering to instructions.
**CO4** Speak effectively in real-time and business situations.
**CO5** Enhance vocabulary through listening and reading.

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | - | - | - | - | 1 | 3 | - | - | 2 | 3 | - | 1 | - | - |
| CO 2 | - | - | - | - | 1 | 3 | - | - | 2 | 3 | - | 1 | - | - |
| CO 3 | - | - | - | - | 1 | 3 | - | - | 2 | 3 | - | 1 | - | - |
| CO 4 | - | - | - | - | 1 | 3 | - | - | 2 | 3 | - | 1 | - | - |
| CO 5 | - | 1 | - | - | 1 | 1 | - | - | 2 | 3 | - | 1 | - | - |
| Mapping Average | - | 1 | - | - | 1 | 2.6 | - | - | 2 | 3 | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of English - VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22MAT12 | MATRICES AND DIFFERENTIAL CALCULUS | L | T | P | C |
|---|---|---|---|---|---|
| | (Common to B.E-CS,AI & ML,B.Tech-AI & DS and IT Programmes) | 3 | 1 | 0 | 4 |

**Preamble**

*The course aims at achieving conceptual understanding of topics such as Matrix Algebra and Calculus. The syllabus is designed to provide the skills for modeling engineering problems and understand the role of calculus in the discipline of engineering and computer science.*

**UNIT 1 EIGEN VALUES AND EIGEN VECTORS** **9+3**

Eigen values and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Statement and application of Cayley Hamilton Theorem – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

**UNIT 2 DIFFERENTIAL CALCULUS** **9+3**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications: Maxima and Minima of functions of one variable

**UNIT 3 ORDINARY DIFFERENTIAL EQUATIONS**

Linear higher order differential equations with constant coefficients – Method of variation of Parameters – Cauchy's and Legendre's linear differential equations

**UNIT 4 MULTIPLE INTEGRALS IN CARTESIAN COORDINATES** **9+3**

Double integration–Change of order of integration, Area between two curves –Triple integration , Volume as triple integrals

**UNIT 5 VECTOR CALCULUS** **9+3**

Gradient of a Scalar point function – Divergence,Curl,Solenoidal and irrotational of a vector point function– Directional Derivative –Green's and Gauss divergence theorems (without proof)

**LECTURE : 45, TUTORIAL : 15, TOTAL : 60 PERIODS**

**TEXT BOOKS:**


1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016
2. James Stewart, " Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015.


**REFERENCES:**


1. Grewal B.S., "Higher Engineering Mathematics" 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. P.Kandasamy, K.Thilagavathy, K.Gunavathy, "Higher Engineering Mathematics", S.Chand & Company Limited, Chennai,2016.


**e-RESOURCES:**

1. https://www.digimat.in/nptel/courses/video/111107112/L14.html -Matrix Analysis with Applications'IIT Roorkee by Dr.S.K.Gupta
2. https://nptel.ac.in/courses/111105122 - 'Integral and Vector Calculus' , IIT Kharagpur by Prof. Hari Shankar Mahato.



Chairperson - BoS
Dept. of Maths- VCET

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Determine eigen values and eigenvectors of real symmetric matrices and reduce the quadratic form to canonical form by orthogonal transformation

CO2 Apply the concept of differential calculus to solve various application problems.

CO3 Solve linear differential equations with constant and variable coefficients .

CO4 Compute area and volume by double and triple integrals in Cartesian co-ordinates

CO5 Compute gradient, directional derivative by vector differentiation and determine line integrals, surface integrals and volume integrals by vector integration.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO4 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO5 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

| 22PHT11 | ENGINEERING PHYSICS | L | T | P | C |
|---|---|---|---|---|---|
| | (Common to all B.E, B.Tech Programmes) | 3 | 0 | 0 | 3 |

**Preamble**

*This course aims to impart the essential concepts of laser, fibre optics, ultrasonics, quantum physics and crystal structure and crystal defects. It also describes the physical phenomena related to the above mentioned concepts and their applications in engineering and provides motivation towards innovations.*

**UNIT I LASER** **9**

Introduction –spontaneous emission and stimulated emission, population inversion, pumping. Einstein's coefficients - derivation. Types of lasers- Nd-YAG-$CO_2$, Semiconductor lasers (homojunction & heterojunction) – Industrial applications - lasers in welding, heat treatment, cutting- medical applications- holography-construction and reconstruction-Safety classes of laser.

**UNIT II FIBRE OPTICS** **9**

Principle and propagation of light in optical fibres – numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – double crucible technique of fibre drawing - splicing, losses in optical fibre, dispersion - fibre optical communication system (Block diagram) - light sources - detectors - fibre optic sensors – temperature & displacement - endoscope.

**UNIT III ULTRASONICS** **9**

Introduction – Production – magnetostriction effect – piezoelectric effect - piezoelectric generator- detection of ultrasonic waves properties – cavitations - velocity measurement – acoustic grating - Industrial applications – drilling, welding, soldering and cleaning – SONAR - non destructive testing – pulse echo system through transmission and reflection modes - A, B and C – scan displays, medical applications - sonograms.

**UNIT IV QUANTUM PHYSICS** **9**

Black body radiation – Planck's theory (derivation) – deduction of Wien's displacement law and Rayleigh – Jeans' law from Planck's theory – Compton effect - theory and experimental verification – matter waves – Schrödinger's wave equation – time independent and time dependent equations – physical significance of wave function – particle in a one dimensional box.

**UNIT-V CRYSTAL PHYSICS** **9**

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – d spacing in cubic lattice – calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – polymorphism and allotropy - crystal defects – point, line and surface defects.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Gaur R.K. and Gupta S.L., "Engineering Physics", 8th Edition, Dhanpat Rai publishers, 2009.
2. Mani Naidu S., "Engineering Physics", 2nd Edition, Pearson Publishing, 2011.

**REFERENCES:**


1. Serway and Jewett, "Physics for Scientists and Engineers with Modern Physics", 9th Edition, Thomson Brooks Cole, 2013
2. Palanisamy P.K., "Engineering Physics", 2nd Edition, Scitech Publications, 2011
3. Chitra Shadrach and Sivakumar Vadivelu, "Engineering Physics", 1st Edition, Pearson Education, 2007.


**e-RESOURSES**

1. http://oupinheonline.com/book/bhattacharya-tandon-engineering-physics/9780199452811.
2. https://www.khanacademy.org/science/physics/quantum-physics.

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Compare Nd-YAG, $CO_2$ and Semiconductor lasers for welding, heat treatment, cutting, medical applications and holography using Stimulated Emission.

CO2 Demonstrate the knowledge of wave optics using light waves for communication system.

CO3 Describe the production and applications of ultrasonics.

CO4 Examine the dual nature of light waves using quantum theory for Black body radiation and Schrodinger's wave equations in particle in a one and three dimensional box.

CO5 Explain the description of a crystal structure in terms of atom positions, unit cells, and crystal symmetry; and to relate the crystal symmetry to the symmetry observed in a diffraction experiment.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | - |
| CO2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | - |
| CO3 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | - |
| CO4 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | - |
| CO5 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of Physics - VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22CYT11 | ENGINEERING CHEMISTRY<br>(Common to all B.E, B.Tech Programmes) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Preamble**

*The study of water technology enables engineers to acquire skills to choose the appropriate method of water treatment for industrial and domestic purposes. Electrochemistry and corrosion explain the fundamentals, identification and corrosion prevention for solving electrochemical and corrosion problems. The study of energy storage devices exposes some of the most commonly used energy storage devices. Nanochemistry empowers engineers to acquire knowledge about nanomaterials and their applications in various fields. Polymeric materials aim to equip the engineering students to realize the importance of chemistry in composites and conducting polymers.*

**UNIT 1 WATER TECHNOLOGY** **9**

Hardness – types and its units – Boiler troubles – scale and sludge, boiler corrosion, caustic embrittlement, priming and foaming – Internal conditioning – carbonate and calgon conditioning - External conditioning – demineralization process – Desalination – electrodialysis, reverse osmosis - Treatment of water for municipal water supply (Removal of suspended particles and disinfection methods – Ozonisation).

**UNIT 2 ELECTROCHEMISTRY AND CORROSION** **9**

Electrochemistry – Emf Series and its applications. Metal Finishing – Manufacture of Printed Circuit Board.Corrosion – mechanism – Galvanic, atmospheric ($O_2$) and Pitting corrosion. Protective coating – electroplating of nickel and electroless copper plating on printed circuit board.

**UNIT 3 ENERGY STORAGE DEVICES** **9**

Batteries – types – Construction and working of Primary battery – Zinc-Air/carbon, Secondary batteries – Lead-acid battery and Lithium-ion battery, Fuel cells – $H_2$-$O_2$ fuel cell and Microbial fuel cell.

**UNIT 4 NANOCHEMISTRY** **9**

Nanomaterials –Types – Synthesis – sol-gel and laser ablation – Characterization – Scanning Electron Microscope and Transmission Electron Microscope – Principle and instrumentation (block diagram) – Properties – optical, electrical, mechanical and magnetic and Applications of nanomaterials – medicine, agriculture, electronics and catalysis.

**UNIT 5 POLYMERS** **9**

Polymers – thermoplastics and thermosetting plastics – polymerization – types (definition only) – Compounding of plastics – fabrication – compression and injection – Composites – polymer matrix composites (Fibre reinforced composites) and metal matrix composites – Conduction polymers – General mechanism of conduction in polymers.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**


1. Engineering chemistry, 17th Edition. P. C. Jain & Monica Jain, Dhanpat Rai Publishing Company, 2021.
2. Applied chemistry, 2nd Edition. P. N. Palanisamy, P. Manikandan, A. Geetha, K. Manjula Rani, McGraw Hill Education (India) Private Limited, 2019.


**REFERENCES:**


1. Wiley Engineering Chemistry, 2nd Edition, Wiley,Wiley India Pvt. Ltd, New Delhi, 2014.
2. Engineering chemistry, 2nd Edition. O. G. Palanna, McGraw Hill Education (India) Private Limited, New Delhi, 2017.
3. A Textbook of NanoScience, 2nd Edition, Dr. Rakesh Kumar, Dr. Kamala Pati Tiwary, S. K. Kataria & Sons, New Delhi, 2013.


Chairperson - BoS
Dept. of CSE - VCET



Chairperson - BoS
Dept. of Chemistry - VCET

**e-RESOURCES:**

1. http://nptel.ac.in/courses/113105028/ , "Science and Technology of Polymers"- Prof. Basudam Adhikari, Materials Science Centre, IIT Kharagpur
2. https://archive.nptel.ac.in/courses/118/102/118102003/ , "Nano structured materials-Synthesis, Properties, Self-Assembly and Applications" - Prof. Ashok K Ganguli, Department of Chemistry, IIT Delhi

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Evaluate the process to purify hard water using internal and external treatment.
CO2 Apply the principle of electrochemistry in PCB etching and surface coating to prevent corrosion.
CO3 Compare and contrast the performance of primary, secondary and flow battery.
CO4 Analyze the characteristics of nanomaterials synthesized by top down and bottom-up process with the aid of SEM and TEM.
CO5 Categorize the types of polymeric materials and fabrication of plastic by injection and compression molding for engineering applications.

**Mapping of COs with POs and PSOs**

| COs\POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | 1 | 1 | 2 | - | 1 | 1 | 1 | 1 | - | - |
| **CO2** | 3 | 2 | 2 | 1 | 1 | 1 | 2 | - | 1 | 1 | 1 | 1 | - | - |
| **CO3** | 3 | 2 | 2 | 1 | 1 | 1 | 2 | - | 1 | 1 | 1 | 1 | - | - |
| **CO4** | 3 | 2 | 2 | 1 | 1 | 1 | 2 | - | 1 | 1 | 1 | 1 | - | - |
| **CO5** | 3 | 2 | 2 | 1 | 1 | 1 | 2 | - | 1 | 1 | 1 | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of Chemistry - VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22CST11 | PYTHON PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | (Common to all B.E, B.Tech Programmes) | 3 | 0 | 0 | 3 |
| | ***(Students admitted during 2023- 24 only)*** | | | | |

**Preamble**

*Python is easy to use, powerful, and versatile, making it a great choice for beginners and experts alike. Python's readability makes it a great first programming language — it allows you to think like a programmer and not waste time understanding the mysterious syntax that other programming languages can require. The syntax in Python helps the programmers to do coding in fewer steps. Python is widely used in bigger organizations because of its multiple programming paradigms.*

**UNIT 1 COMPUTING FUNDAMENTALS** **9**

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

**UNIT 2 INTRODUCTION TO PYTHON** **9**

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

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

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

**UNIT 4 LISTS, TUPLES, DICTIONARIES** **9**

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

**UNIT 5 FILES, MODULES AND PACKAGES** **9**

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

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**


1. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, 2017.
2. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.


**REFERENCES:**


1. E Balagurusamy," Problem Solving and Python Programming", McGraw Hill Education, 2018
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1stEdition, Notion Press, 2021.


Chairperson - BoS
Dept. of CSE - VCET

**e-RESOURCES:**

1. https://swayam.gov.in/course/4178-spoken-tutorial-python-english, "Introduction to Python", Prof. Prabhu Ramachandran, IIT Bombay.
2. https://onlinecourses.nptel.ac.in/noc18_cs21, "Programming, Data Structures and Algorithms Using Python", Prof.Madhavan Mukund, IIT-Bombay.

**Course Outcomes:** Upon completion of this course, students will be able to:

| | |
|---|---|
| CO1 | Use the basics of algorithmic problem solving techniques (pseudo code, flow chart, language basics) for a given problem. |
| CO2 | Apply suitable python conditional and looping statements to solve a given problem. |
| CO3 | Define Python functions and use function calls to solve problems. |
| CO4 | Use Python data structures (lists, tuples, and dictionaries) to represent complex data. |
| CO5 | Create python packages, modules and files for a given scenario. |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | 1 | - | - |
| **CO2** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | 1 | - | - |
| **CO3** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | 1 | - | - |
| **CO4** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | 1 | - | - |
| **CO5** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22MET11 | ENGINEERING GRAPHICS<br>(Common to all B.E, B.Tech Programmes) | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 4 | 4 |

**Preamble**

*The knowledge of Engineering graphics is essential for the Engineering graduates in proposing new product designs through drawings and interpreting data from existing drawings. Engineering Design inculcates into an Engineer the creativity and knowledge on various aspects to be considered while designing and realizing the functional products and processes. This course deals with Engineering curves, orthographic and pictorial projections, sectional views and development of surfaces.*

**UNIT 1 INTRODUCTION AND PLANE CURVES** **12**

Importance of graphics in Engineering applications – Use of drafting instruments – BIS conventions and specifications –Size, layout and folding of drawing sheets – Diagonal scales and vernier scales- Lines, lettering and dimensioning - Basic geometrical constructions (circular and polygonal surfaces). (PRACTICE ONLY AND NOT FOR EXAMINATIONS).

Curves used in Engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

**UNIT 2 PROJECTION OF POINTS, LINES AND PLANE SURFACES** **12**

Orthographic projection- principles-Principal Planes - First angle projection- Projection of points in four quadrants – End point projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method.

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT 3 PROJECTION OF SOLIDS** **12**

Projection of simple solids- Cube, prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane and parallel to the other by rotating object method.

**UNIT 4 SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES** **12**

Sectioning of above solids in simple vertical position when cut by a cutting plane which is inclined to one of the reference planes and perpendicular to the other – Obtaining true shape of section.

Development of lateral surfaces of simple and truncated solids in simple vertical position – Cube, prisms, pyramids, cylinder and cone.

**UNIT 5 ISOMETRIC AND FREE HAND SKETCHING** **12**

Principles of isometric projection – Isometric scale –Isometric projections of simple solids - Prisms, pyramids, cylinder and cone- Combination of two solid objects in simple vertical position.

Visualization concepts- Free hand sketching – Conversion of Isometric view to orthographic views. Perspective projection of simple solids (Qualitative only).

Introduction to CAD software (Not for Examinations)

**LECTURE : 45, PRACTICAL : 15, TOTAL : 60 PERIODS**

**TEXT BOOKS:**


1. Venugopal K and Prabhu Raja V., "Engineering Graphics", New Age International (P) Ltd, 13th Edition, 2015.
2. Jeyapoovan T. , "Engineering Graphics with AUTOCAD", Vikas Publishing House Pvt., Ltd., 7th Edition, 2015.

**REFERENCES:**


1. Bhatt N.D., Panchal, V.M. and Ingle P.R., "Engineering Drawing", Charotar Publishing House Pvt. Ltd., 53rd Edition, 2014.
2. Parthasarathy N.S. and Vela Murali, "Engineering Drawing", Oxford University Press, 1st Edition, Second Impression 2015.
3. Luzzader W..J. and Duff J.M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.


**e-RESOURCES:**

1. http://nptel.ac.in/courses/105104148, "Engineering Graphics" - Dr. Nihar Ranjan Patra , IIT Kanpur
2. http://cfd.annauniv.edu/webcontent.htm, "Engineering Graphics" - Dr. Velamurali

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Draw the various conic sections and Engineering curves
CO2 Sketch projections of lines and planes with vertical and inclined positions
CO3 Draw the projections of solids kept in various positions.
CO4 Sketch sectioned views of solids and development of surfaces.
CO5 Draw the isometric and orthographic views from given pictorial views.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | - | - | - | - | - | - | 2 | - | 1 | - | - |
| CO2 | 3 | 2 | 1 | - | - | - | - | - | - | 2 | - | 1 | - | - |
| CO3 | 3 | 2 | 1 | - | - | - | - | - | - | 2 | - | 1 | - | - |
| CO4 | 3 | 2 | 1 | - | - | - | - | - | - | 3 | - | 2 | - | - |
| CO5 | 3 | 2 | 1 | - | - | - | - | - | - | 3 | - | 2 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of ME - VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22HST11 | HERITAGE OF TAMILS | L | T | P | C |
|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 1 |

**UNIT 1 LANGUAGE AND LITERATURE** 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

**UNIT 2 HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE** 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

**UNIT 3 FOLK AND MARTIAL ARTS** 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

**UNIT 4 THINAI CONCEPT OF TAMILS** 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

**UNIT 5 CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIANCULTURE** 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

**Total : 15**

**TEXT-CUM-REFERENCE BOOKS**


1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கேபிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள்கழகம்)

2 கணினித் தமிழ் – முனைவர் இல.சுந்தரம்.( விகடன் பிரசுரம்).

3 கீழடி–வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4 பொருநை – ஆற்றங்கரை நாகரிகம்.( தொல்லியல் துறை வெளியீடு).

5 Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6 Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7 Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8 The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).

9 Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).

10 Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

11 Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12 Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.


Chairman BoS
Dept. of CSE - VCET

| 22PHL11 | PHYSICS AND CHEMISTRY LABORATORY I | L | T | P | C |
|---|---|---|---|---|---|
| | (Common to all B.E, B.Tech Programmes) | 0 | 0 | 2 | 1 |

**Preamble**

*This course aims to impart knowledge in the determination of the physical parameters such as wavelength of laser and mercury spectrum, Numerical aperture and acceptance angle of an optical fiber, velocity of ultrasonic waves and thermal conductivity of bad conductor and additionally necessitate the practical skills in determination of rate of corrosion in mild steel, water quality parameters and amount of iron in the given sample.*

## PHYSICS LABORATORY I

### LIST OF EXPERIMENTS

1. Determination of Optical property of Laser and Particle size of Lycopodium powder.
2. Determination of Numerical aperture and acceptance angle of an optical fiber.
3. Determination of velocity of ultrasonic waves- Ultrasonic Interferometer.
4. Determination of wavelength of mercury spectrum- Spectrometer grating.
5. Determination of Thermal conductivity of Bad conductor.

## CHEMISTRY LABORATORY I

### LIST OF EXPERIMENTS

1. Determination of alkalinity in water sample
2. Determination of Calcium and Magnesium hardness in water by EDTA method.
3. Determination of rate of corrosion in Mild steel by weight loss method.
4. Determination of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method).
5. Determination of iron content of the given solution using a potentiometer

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Experiment and determine the optical property of light sources and acceptance angle of optical fiber using Laser and Spectrometer.

CO2 Experiment and determine the velocity of ultrasonic waves and thermal conductivity of a given bad conductor using ultrasonic interferometer and Lee's disc.

CO3 Experiment and estimate type and amount of alkalinity, Calcium and Magnesium hardness in water sample using titrimetry.

CO4 Experiment and determine the rate of corrosion in mild steel by weight loss method.

CO5 Experiment and determine the amount of iron content present in the given sample using potentiometer and spectrophotometer.

**Mapping of COs with POs and PSOs**

| COs\POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | - | 3 | - | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - |
| CO2 | 2 | 1 | - | 3 | - | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - |
| CO3 | 2 | 1 | - | 3 | - | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - |
| CO4 | 2 | 1 | - | 3 | - | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - |
| CO5 | 2 | 1 | - | 3 | - | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - |

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) "-" No correlation

Chairperson - BoS
Dept. of Chemistry - VCET

Chairperson - BoS
Dept. of Physics - VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22CSL11 | PYTHON PROGRAMMING LABORATORY<br>(Common to all B.E, B.Tech Programmes) | L T P C<br>0 0 2 1 |
|---|---|---|

**Preamble:**

*Python is a dynamic and powerful programming language that focuses on code readability. The Python language has diversified application in the software development companies such as in gaming, web frameworks and applications, language development, prototyping, graphic design applications, etc. This provides the language a higher plethora over other programming languages used in the industry.*

**LIST OF EXPERIMENTS**

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

**SOFTWARE**

- Python 3 interpreter / open source IDE
- Raptor Tool
- Libre Office Packages

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Design flowcharts using Raptor. |
| CO2 | Develop programs using expressions and Control statements in Python. |
| CO3 | Develop programs using functions, packages for a given problem.. |
| CO4 | Process compound data using Python data structures |
| CO5 | Utilize Python packages in developing software applications. |

Chairperson - BoS
Dept. of CSE - VCET

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22CSL11 | PYTHON PROGRAMMING LABORATORY<br>(Common to all B.E, B.Tech Programmes)<br>*(Students admitted during 2024- 25 onwards)* | L T P C<br>0 0 3 1 |
|---|---|---|

**Preamble:**
Python is a dynamic and powerful programming language that focuses on code readability. The Python language has diversified application in the software development companies such as in gaming, web frameworks and applications, language development, prototyping, graphic design applications, etc. This provides the language a higher plethora over other programming languages used in the industry.

**LIST OF EXPERIMENTS**

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
   (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions
   (exchange the values of two variables, circulate the values of n variables, distance between two points)
3. Scientific problems using Conditionals and Iterative loops.
   (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples.
   (Items present in a library/Components of a car/ Materials required for construction of a building – operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries.
   (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions.
   (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings.
   (reverse, palindrome, character count, replacing characters)
8. Implementation of searching algorithms using linear and binary search technique.
9. Implementation of sorting algorithms using selection sort and insertion sort method.
10. Implementing programs using written modules and Python Standard Libraries
    Libraries (pandas, numpy. Matplotlib, scipy)
11. Implementing real-time/technical applications using File handling.
12. Developing a game activity using Pygame like bouncing ball, car race.

**SOFTWARE**

- Python 3 interpreter / open source IDE
- Raptor Tool
- Libre Office Packages

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Design flowcharts using Raptor. |
| CO2 | Develop programs using expressions and Control statements in Python. |
| CO3 | Develop programs using functions, packages for a given problem.. |
| CO4 | Process compound data using Python data structures |
| CO5 | Utilize Python packages in developing software applications. |

Chairperson - BoS
Dept. of CSE - VCET

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 2MCT02 | UNIVERSAL HUMAN VALUES<br>(Common to All B.E/ B.TECH programmes) | L T P C<br>0 0 2 0 |
|---|---|---|

**Preamble:**

*Universal Human Values is a life skill necessary for all to develop physical health and factors for strengthening life force. This course aims to expose the students in the areas of mediation and impart the knowledge on social virtues and morals.*

**UNIT 1 Physical Health** **6**

SKY – Introduction – Education as a means for youth empowerment – Greatness of Education – Yoga for Youth Empowerment – Simplified Physical Exercises: Explanation – Hand, Leg, Breathing and Eye exercises – Kapalabathi, Makarasanam, Massaging, Acupressure and Relaxation practices –Yogasanas-Explanation – Benefits.

**UNIT 2 Strengthening Life Forces** **6**

Reasons for Diseases: Natural Reasons (Hereditary, Planetary Position, Natural Calamities and Climatic changes) – Artificial Reasons (Food, Thought, Deed). Philosophy of Kayakalpa: Physical Body –Life Force – Biomagnetism – Mind. Maintaining Youthfulness – Postponing Aging – Transformation of Food into seven Body constituents.

**UNIT 3 Wellness of Mind** **6**

Classification of Mind Waves – Beta, Alpha, Theeta, Delta – Agna Meditation – Benefits. Shanthi Mediation – Benefits. Thuriya Meditation – Benefits. Blessing and its Benefits: Auto Suggestion – Blessing the family and others – Blessings the World – Divine Protection.

**UNIT 4 Virtues** **6**

**Individual Virtues:** Self Control – Self Confidence – Speaking Truth – Contentment – Humility – Mind Control. Tolerance – Adjustment – Sacrifice – Forgiveness. Cleanliness (Body, Dress, Surrounding)-External, Mental, Inner Cleanliness. **Societal Virtues :**Ahimsa – Services, Patriotism – Equality, Respecting the parents and elders – Caring for them – Respecting Teachers. Punctuality – Time Management.

**UNIT 5 Morals** **6**

Importance of introspection: I and Mine (Ego, Possessiveness), Six Temperaments: Greed – Anger – Miserliness – Immoral Sexual Passion – Inferior Superior complex – Vengeance. Maneuvering the Six Temperaments: Contentment – Tolerance – Charity – Chastity – Parity – Forgiveness. Five important Benefits of Meditation: Perspicacity – Magnanimity – Adaptability – Receptivity – Creativity. (Enhancing memory) (Effective Examination Preparation)

**TOTAL : 30 PERIODS**

**TEXT BOOKS:**


1. "Yoga for Youth Empowerment" compiled by Vethathiri Maharishi Institute for Spiritual and Institutional Education, Aliyar, Pollachi, 1st Edition 2016.
2. "Yoga for Human Excellence", compiled by Vethathiri Maharishi Institute for Spiritual and Institutional Education, Aliyar, Pollachi 1st Edition 2009.


**e-RESOURCE:**

1. www.online.vethathiri.edu.in "online in (Virtual) Programme on Yoga and Human Excellence".

Chairperson - BoS
Dept. of Maths- VCET

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Demonstrate the knowledge on physical health

CO2 Discuss the various factors for strengthening life force

CO3 Classify mind waves and explain the benefits of meditation

CO4 Explain individual and social virtues

CO5 Identify and explain the importance of morals.

**Mapping of COs with POs and PSOs**

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) "-"No correlation

Chairperson - BoS
Dept. of Maths- VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22ENT21 | **PROFESSIONAL ENGLISH**<br>*(Common to all B.E./B. Tech Programmes)*<br>*(Students admitted during 2023- 24 onwards)* | **L T P C**<br>**3 0 0 3** |
|---|---|---|

**Preamble:**

*The course Professional English aims at developing LSRW skills which are essential for the learners to communicative effectively and appropriately in professional contexts through acquisition of grammar and vocabulary.*

**UNIT 1 ANALYTICAL READING** **9**

**Listening:** Listening to Anecdotes - Stories - Event Narration – Documentaries and Interviews with Celebrities - Advertisements - Listening and Gap Filling Exercises **Speaking:** Conversation Skills – Initiating - Turn Taking - Closing – Explaining how something works - Persuasive Speech Techniques **Reading:** Reading Advertisements - User Manuals - Analytical Reading - Deductive and Inductive Reasoning **Writing:** Professional E-mails – E-mail Etiquette – Compare and Contrast Essays **Grammar & Vocabulary:** Prepositional Phrases –Same Word used as Different Parts of Speech.

**UNIT 2 SUMMARISING** **9**

**Listening:** Listening to Lectures - Talks and Completing Gap Filling Exercises on Science and Technology – Listening Technical Information from Podcasts **Speaking:** Summarizing - Oral Reporting – Narrating Personal Experiences – Events – Interviewing a Celebrity **Reading:** Reading Scientific and Technical Articles - Texts **Writing:** Lab Reports - Summary Writing. **Grammar & Vocabulary:** Impersonal Passive Voice - Purpose Expressions.

**UNIT 3 DESCRIBING VISUAL MATERIALS** **9**

**Listening:** Listening to the Panel Discussion **Speaking:** Speaking at Formal Situations –Mini Presentation and Making Recommendations **Reading:** Reading Journal Articles - Speed Reading - Interpretation of Graphics – Flow Chart - Bar Chart **Writing:** Data Commentaries - Describing Visual Materials – Mechanics of Writing - Writing Complaints to Editorial Columns **Grammar & Vocabulary:** Subject-Verb Agreement – Pronouns - Relative Pronouns - Numerical Adjectives.

**UNIT 4 WRITING E-MAILS AND JOB APPLICATION LETTERS** **9**

**Listening:** Listening to Model Interviews **Speaking:** Speaking at Interviews – Role Play Practice **Reading:** Reading Job Advertisements and Company Profile - Statement of Purpose (SOP) **Writing:** Filling up the Job Application – Cover Letter – Résumé Preparation – Internship Application **Grammar & Vocabulary:** 'If' Conditionals – Infinitives – Gerunds - Compound Nouns.

**UNIT 5 REPORT WRITING** **9**

**Listening:** Viewing a Model Group Discussion **Speaking:** Participating in a Group Talk – **Reading:** Cause and Effect Essays – Business Letters **Writing:** Types of Reports - Report Format - Industrial Accident Report - Industrial Visit Report – Feasibility Report - Designing and Reporting Surveys – Writing Discursive Essays **Grammar & Vocabulary:** Reported Speech – Idioms and Phrases.

**TOTAL: 45 PERIODS**

**TEXT BOOK:**

1. 'English for Engineers and Technologists' Volume 1 published by Orient Black Swan Limited .2019.

**REFERENCES:**


1. Richards, Jack. C with Jonathan Hull and Susan Proctor New Interchange: English for International Communication. (Level2, Student's Book) Cambridge University Press, New Delhi: 2017.
2. Sanjay Kumar and Pushp Lata, "Communication Skills: A Workbook , Oxford University Press, 2020.
3. J K Gangal, "A Practical course in Spoken English", PHI Learning Pvt. Ltd., 1st Edition, Delhi, 2014.


**e. RESOURCES :**

1. www.eslgold.com
2. www.usingenglish.com



Chairperson - BoS
Dept. of English - VCET

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Read for gathering and understanding information using narrative techniques.

**CO2** Develop and demonstrate listening skills for academic and professional purposes.

**CO3** Apply apt vocabulary and construct grammatically correct sentences in professional situations.

**CO4** Face interviews with communicative competence and confidence with a good knowledge of career skills.

**CO5** Enhance writing skills for essays and for preparing reports.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | - | - | - | - | 1 | 3 | - | - | 2 | 3 | - | 1 | - | - |
| CO 2 | - | - | - | - | 1 | 3 | - | - | 2 | 3 | - | 1 | - | - |
| CO 3 | - | 1 | - | - | 1 | 3 | - | - | 2 | 3 | - | 1 | - | - |
| CO 4 | - | - | - | - | 1 | 3 | - | - | 2 | 3 | - | 1 | - | - |
| CO 5 | - | - | - | - | 1 | 1 | - | - | 2 | 3 | - | 1 | - | - |
| Mapping Average | - | 1 | - | - | 1 | 2.6 | - | - | 2 | 3 | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of English - VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22MAT22 | PROBABILITY AND STATISTICS | L | T | P | C |
|---|---|---|---|---|---|
| | (Common B.E – CS,AI & ML and B.Tech – IT, AI & DS Programmes) | 3 | 1 | 0 | 4 |

**Pre-requisites :** Matrices and Differential Calculus

**Preamble**

*Probability theory is an important foundation for computer science field such as machine learning, artificial intelligence, computer graphics and randomized algorithms. Statistics is the language of the uncertainties in the modern information age. It's descriptive and inferential roles not only formulate the basis of the growth of almost all the disciplines of the contemporary world, but also provide an array of non-traditional employment avenues ranging from that of sport analysis to business analysis..*

**UNIT 1 PROBABILITY THEORY** 9+3

Basic definitions and rules for probability, conditional probability-independence of events-Baye's theorem- Random variables - Discrete and continuous random variables. Distributions: Discrete distributions – Binomial, Poisson – Continuous distributions –Uniform, Exponential and Normal distributions.

**UNIT 2 TWO DIMENSIONAL RANDOM VARIABLES** 9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression

**UNIT 3 ESTIMATION THEORY** 9+3

Estimation :Point and interval estimation-Confidence Interval for the population Mean for Large and Small Samples,Confidence Interval for the Population Proportion for Large Samples

**UNIT 4 TESTING OF HYPOTHESIS** 9+3

Large sample test based on Normal distribution for single mean and difference of means – Small sample tests based on t distributions for testing of means and F distributions for testing of variances – $\chi^2$ test – Contingency table (Test for Independency) – Goodness of fit.

**UNIT 5 ANALYSIS OF VARIANCE** 9+3

Assumptions, One way and two way classifications - Completely randomized design – Randomized block design –Latin square design.

**Lecture : 45; Tutorial : 15; Total : 60**

**TEXT BOOKS:**


1. Ibe O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Edition 2014.
2. Walpole R.E., Myers R.H., Myers S.L., and Ye K., "Probability and Statistics for Engineers and scientists", 9th Edition, Pearson Education India,2012.


**REFERENCES:**


1. Johnson R.A., 'Miller and Freund's Probability and Statistics for Engineers," 8th Edition, Pearson Education India, 2011.
2. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata McGraw Hill, 4th Edition, New Delhi, 2002.
3. Veerarajan T., "Probability, Statistics and Random Processes with Queueing theory and Queueing Networks", 4th Edition, Tata McGraw Hill Edition, New Delhi, 2015.


Chairperson - BoS
Dept. of Maths- VCET



Chairperson - BoS
Dept. of CSE - VCET

**e-Resources:**

1. http://nptel.ac.in/courses/111104075/13, "Analysis of Variance and Design of Experiments, Module-III,Dr.Shalabh, Department of Mathematics and Statistics, Indian Institute of Technology,Kanpur.
2. http://nptel.ac.in/courses/111105041/40/, "Probability and Statistics", Prof. Dr. Somesh Kumar, Department of Mathematics, Indian Institute of Technology, Kharagpur.

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Solve the problems involving discrete and continuous distributions using the properties of Probability.

CO2 Measure the degree of relationship between the two dimensional random variables using correlation and regression.

CO3 Analyze the estimation problems using suitable estimators.

CO4 Test the hypothesis for given small and large samples and determine the Goodness of fit of the sample using Chi-square test.

CO5 Analyze the given samples based on their variance.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO4 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO5 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).



Chairperson - BoS
Dept. of Maths- VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22PHT22 | PHYSICS FOR INFORMATION SCIENCES (Common to B.E-CS, AI & ML, B.Tech-AI&DS and IT Programmes) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Prerequisites :** Engineering Physics

**Preamble**

*Knowledge about the electronic structure of metals and semiconductors has manifested as a technology to design materials of desired properties. The knowledge of magnetic materials, superconductors and optical behavior of materials form the basis of solid state devices. Nanomaterials are envisioned in self-replicating robots at the molecular scale, in engines of creation.*

**UNIT 1 CONDUCTING MATERIALS** 9

Conductors – Classical free electron theory of metals – Electrical and thermal conductivities - Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory –Fermi distribution function – Effect of temperature on Fermi function – Density of energy states –Carrier concentration in metals.

**UNIT 2 SEMICONDUCTING MATERIALS** 9

Classification of Semiconductors - Intrinsic semiconductor – Carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – Electrical conductivity – Band gap determination – Derivation of carrier concentration in n-type and p-type semiconductor– Variation of Fermi level with temperature and impurity concentration - Hall effect – Determination of Hall coefficient – Zener diode- Varactor diode.

**UNIT 3 MAGNETIC AND SUPERCONDUCTING MATERIALS** 9

Origin of magnetic moment – Bohr magneton – Comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – Soft and hard magnetic materials – Antiferromagnetic materials-Uses of Magnetic materials in computers-Hard disk drive-CRT motors-Cooling fans-Optical disc drives.

Superconductivity : Properties – Type I and type II superconductors –BCS theory of superconductivity (qualitative) – High Tc superconductors – Josephson effect -Applications of superconductors –SQUID, cryotron, magnetic levitation.

**UNIT 4 OPTICAL MATERIALS** 9

Classification of optical materials – Absorption in metals, insulators & Semiconductors (concept only)-carrier generation and recombination processes-LED's – Organic LED's – Polymer light emitting materials – Plasma light emitting devices— Laser diodes – Optical data storage techniques, LCD.

**UNIT 5 NANOMATERIALS** 9

Nanomaterials: Introduction-properties –Classification of synthesis routes- Methods of Synthesis- Ball milling – Sol gels –Chemical Vapour Deposition (CVD) – Applications of Nanomaterials. Nanoforms of Carbon - Buckminster fullerene- graphene –Carbon nanotubes : Fabrication – Arc method – Pulsed Laser Deposition (PLD)- Quantum wires, Quantum dots-preparation, properties and applications.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**


1. Palanisamy P.K, "Materials Science", 2nd Edition, Scitech publications (India) Pvt. Ltd., Chennai, 2015.
2. S.O.Pillai "Solid State Physics",9th Edition,New Age International(P) Ltd,Publishers New Delhi,2020.


Chairperson - BoS
Dept. of Physics - VCET



Chairperson - BoS
Dept. of CSE - VCET

**REFERENCES:**


1. Balasubramaniam R, "Callister's Materials Science and Engineering", 2nd Edition, Wiley-India 2014.
2. Charles P. Poole and Frank J.Owens, "Introduction to Nanotechnology", 1st Edition, Wiley, New Delhi, December 2020.
3. Donald A.Neamen, "Semiconductor Physics and Devices: Basic Principles",4th Edition, Tata McGraw-Hill, 2012


**e-RESOURCES**

1. http://nptel.ac.in/courses/122102008 , "Materials Science" – Dr. S. K. Gupta, IIT Delhi
2. https://www.khanacademy.org/science/physics/magnetic-forces-and-magnetic-fields

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Explain the behaviour of conducting materials based on classical and Quantum theory for Electrical and Thermal conductors.

CO2 Demonstrate the knowledge on semiconductors with respect to carrier concentration and hall effect using density of energy states.

CO3 Compare the properties of magnetic materials for dia, para and ferro magnets and discuss the applications of Magnetic materials and superconductors using CRT Motors,Cooling fans SQUID, Cryotron and MAGLEV.

CO4 Discuss the functioning of optical materials in metals,insulators and semiconductors for optical data storage devices.

CO5 Describe the synthesis and characterization of nano materials using CVD, PLD, Arc method for carbon nano tubes.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | - |
| CO2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | - |
| CO3 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | - |
| CO4 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | - |
| CO5 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).



Chairperson - BoS
Dept. of Physics - VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22EET11 | BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common to B.E-CE,CS, AI&ML,ME, B.Tech-AI&DS, and IT Programmes) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Preamble**

*The course covers the fundamentals of basic electrical circuit parameters of both ac and dc circuits and the characteristics of motors and generators. The basics of semiconductor devices and logic gates provides the necessary initiative for the students to acquire the knowledge in basic electronics.*

**UNIT 1 DC CIRCUITS AND AC CIRCUITS** **9**

DC Circuits: Basic Definitions - Resistance: Resistors in Series and Parallel - Ohm's Law - Method of solving a circuit by Kirchoff's laws. AC Circuits: Basic Definitions - Alternating Voltage and Current, R.M.S and Average Value, Power Factor, Form Factor and Peak Factor - Analysis of AC Circuit: R, L, C, Series RL, RC & RLCCircuits.

**UNIT 2 POWER SYSTEMS** **9**

Structure of Power System - Generation: Introduction to Conventional and Non Conventional Energy Sources - Transmission: Overhead and Underground Systems - Distribution: Single phase 2-wire system, three phase 3-wire and three phase 4-wire system - Basic principles of Earthing - Types: Plate earthing and Pipe earthing.

**UNIT 3 ELECTRICAL MACHINES** **9**

Laws of Electromagnetic Induction - Fleming"s Right and Left hand rule - Lenz"s law. DC Generator: Construction and working principle - DC Shunt Motor: Construction, working principle and Characteristics - Single Phase Induction Motor: Split Phase and Capacitor Start Induction Motor

**UNIT 4 ELECTRONICS DEVICES** **9**

PN junction Diode and its Characteristics - Zener Diode and its Characteristics - Half and Full wave Rectifiers - Bipolar Junction Transistor - CE configuration and its characteristics.

**UNIT 5 DIGITAL ELECTRONICS** **9**

Boolean Algebra - Theorems and Laws - De-Morgan's theorem - Logic Gates - Universal Gates - Implementation of Boolean functions. Binary Arithmetic: Addition - Subtraction - Multiplication - Division - Half adder and Full adder circuits.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**


1. Muthusubramanian R and Salivahanan S, "Basic Electrical and Electronics Engineering", McGraw Hill Education, 1st Edition, 2014.
2. Mittle V N and Aravind Mittal, "Basic Electrical engineering", McGraw Hill Education, 2nd Edition, 2006.


**REFERENCES:**


1. V.K.Mehta and Rohit Mehta, "Principles of Electrical Engineering and Electronics", S.Chand& Company Ltd,2015.
2. SedhaR.S.,"Applied Electronics",S.Chand& Company Ltd,2006.
3. Thomas L.Floyd.,"DigitalFundamentals",PearsonEducation,PrenticeHall,Tenth Edition,2010.




Chairperson - BoS
Dept. of EEE - VCET

Chairperson - BOS
Dept. of CSE - VCET

**e-RESOURCES:**

1. NPTEL, http://nptel.ac.in/courses/117106101/ , "Basic Electrical Circuits", Prof. NagendraKrishnapura, IIT,Madras.
2. NPTEL, http://nptel.ac.in/downloads/108105053/ , "Basic Electrical Technology", Prof. Dr. L. Umanand, IIS,Bangalore.

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Analyze the various DC and AC circuits and find the circuit parameters.
CO2 Describe the principles of power system engineering.
CO3 Illustrate the construction and working principle of electrical machines.
CO4 Explain the basics of semiconductor devices and its applications.
CO5 Describe the basics of Number systems and Logic gates.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | - | - | - | 1 | - | - | - | - | 1 | - | - |
| CO2 | 2 | 3 | 2 | - | - | - | 1 | - | - | - | - | 1 | - | - |
| CO3 | 2 | 3 | 2 | - | - | - | 1 | - | - | - | - | 1 | - | - |
| CO4 | 2 | 3 | 2 | - | - | - | 1 | - | - | - | - | 1 | - | - |
| CO5 | 2 | 3 | 2 | - | - | - | 1 | - | - | - | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).



Chairperson - BoS
Dept, of EEE - VCET

Chairperson - BoS
Dept. of CSE - VCET

IT

| 22ITT21 | C PROGRAMMING | L T P C |
|---|---|---|
| | (Common to B.E-CS, B.Tech-AI&DS and IT Programmes) | 3 0 0 3 |

**Preamble:**

*This course aims at giving adequate exposure to students on the principles of procedural programming language. The course is intended to introduce the students to computational thinking and make the students develop C Programs using basic programming constructs. The course will enable the students to apply the fundamentals of C programming to solve Engineering problems.*

**UNIT 1 BASICS OF C PROGRAMMING** 9

Introduction to Programming – Introduction to C - Structure of C program – Compilation and Execution - C Tokens –Keywords, Variables, Constants - Data Types – Input/output statements - Operators: Precedence and Associativity - Expressions – Type Conversion and Typecasting - Decision control and Looping statements - Preprocessor directives. Case study: EB Bill Generation

**UNIT 2 ARRAYS AND STRINGS** 9

Introduction to Arrays: Declaration, Initialization – One dimensional array –Linear Search, Binary Search. Two dimensional arrays – Matrix Operations (Addition, Multiplication and Transpose) – Strings - String operations: length, compare, concatenate, copy, reverse – Array of Strings. Case Study: Sorting of student namelist in a classroom

**UNIT 3 FUNCTIONS AND POINTERS** 9

Introduction to functions - Built-in functions (string functions, math functions) – User-defined functions - Function prototype, function definition, function call – Parameter passing: Pass by value, Pass by reference - Recursion. Pointers – Declaration – Pointer expression and Pointer arithmetic – Array of pointers –Function Pointers – Case Study: Scientific calculator using built-in functions and user defined functions

**UNIT 4 STRUCTURES, UNION AND ENUMERATED DATATYPES** 9

Structure - Nested structures – Pointer and Structures – Array of structures – Structure and Functions – Union - Example Programs using structures and Unions – Enumerated Data types. Case Study: Create employee datasheet using Structure, Union.

**UNIT 5 FILE PROCESSING** 9

Introduction to Files – Using Files in C – Reading and writing Files –Types of file processing: Sequential access, Random access - Functions for selecting a record - Command line arguments - Storage classes – Dynamic memory allocation. Case study: Processing stock details of Library.

**TEXT BOOKS:** **TOTAL: 45 PERIODS**


1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", 3rd Edition, Oxford University Press, 2013.


**REFERENCES:**


1. Paul Deitel and Harvey Deitel, C How to Program with an Introduction to C++, Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.


Chairperson - BoS
Dept of IT VCET



Chairperson - BoS
Dept. of CSE - VCET

**e-RESOURCES:**

1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs45/preview

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Develop program in C, equivalent to a given problem statement and solve it by applying appropriate data types and control statements.

CO2 Reproduce and process the given list or table of data using sorting or searching techniques in C

CO3 Categorize the given problem statement into functions and synthesize a complete program using procedural approach of C language and develop C programs using pointers to access arrays and functions.

CO4 Apply user defined data types like structures and unions to solve problems.

CO5 Develop C programs to store and process the given data using files.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 | - | - | 2 | - | - | - | - | 1 | - | - |
| CO2 | 3 | 2 | 3 | 2 | - | - | 2 | - | - | - | - | 1 | - | - |
| CO3 | 3 | 2 | 3 | 2 | - | - | 2 | - | - | - | - | 1 | - | - |
| CO4 | 3 | 2 | 3 | 2 | - | - | 2 | - | - | - | - | 1 | - | - |
| CO5 | 3 | 2 | 3 | 2 | - | - | 2 | - | - | - | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson BoS
Dept of IT VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22HST21 | TAMILS AND TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 1 |

**UNIT 1 WEAVING AND CERAMIC TECHNOLOGY** **3**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries

**UNIT 2 DESIGN AND CONSTRUCTION TECHNOLOGY** **3**

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

**UNIT 3 MANUFACTURING TECHNOLOGY** **3**

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

**UNIT 4 AGRICULTURE AND IRRIGATION TECHNOLOGY** **3**

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

**UNIT 5 SCIENTIFIC TAMIL & TAMIL COMPUTING** **3**

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

**Total : 15**

**TEXT-CUM-REFERENCE BOOKS**


1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கேபிள்ளை ( வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள்கழகம்)
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம்.( விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம்.( தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
13. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.




Chairperson - BoS

| 22PHL21 | PHYSICS AND CHEMISTRY LABORATORY II | L | T | P | C |
|---|---|---|---|---|---|
| | (Common to all B.E, B.Tech Programmes) | 0 | 0 | 2 | 1 |

**Preamble**

*This course aims to impart knowledge in the determination of the physical parameters such as young's modulus, band gap, Co-efficient of viscosity, thickness of thin wire and Rigidity modulus of wire. This course also aims to impart the significance and estimation of DO and $Cl^-$ content in water sample by titrimetric method. Amount of $Na^+$, $Ba^{2+}$ and acid with electroanalytical techniques such as flame photometry, conductometry and pH meter in the aqueous solutions has been quantitatively analyzed.*

## PHYSICS LABORATORY II
## LIST OF EXPERIMENTS

1. Determination of Young's modulus by Uniform bending method.
2. Determination of bandgap of semiconductors.
3. Determination of co-efficient of viscosity by Poiseuille's method.
4. Determination of thickness of thin wire by Air wedge method.
5. Determination of rigidity modulus-torsion pendulum.

## CHEMISTRY LABORATORY II
## LIST OF EXPERIMENTS

1. Determination of Dissolved Oxygen content of waste water sample by Winkler's method.
2. Determination of chloride content of wastewater sample by Argentometric method.
3. Estimation of dissolved metal ions present in wastewater using flame photometer.
4. Conductometric precipitation titration of $BaCl_2$ vs $Na_2SO_4$ using conductivity meter.
5. Determination of acid strength in waste water using pH meter.

**TOTAL : 45 PERIODS**

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Experiment and determine the physical characteristics of given solid materials using Young's modulus-Uniform bending method, Air wedge and Torsion Pendulum

CO2 Experiment and determine the band gap energy of a given semiconducting material using Zener diode.

CO3 Experiment and determine the physical characteristics of a given liquid using Poiseuille's method.

CO4 Experiment and estimate the amount of dissolved oxygen by Winkler's method and Chloride content by Mohr's method.

CO5 Analyse the concentration of metal ions and acid present in the wastewater with the aid of Flame photometer, Conductivity meter and pH meter.

**Mapping of COs with POs and PSOs**

| COs\POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | - | 3 | - | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - |
| CO2 | 2 | 1 | - | 3 | - | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - |
| CO3 | 2 | 1 | - | 3 | - | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - |
| CO4 | 2 | 1 | - | 3 | - | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - |
| CO5 | 2 | 1 | - | 3 | - | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - |

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) "-" No correlation

Chairperson, BoS
Dept. of Physics - VCET

Dept. of Chemistry - VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22ITL21 | C PROGRAMMING LABORATORY | L T P C |
|---|---|---|
| | (Common to B.E-CS, B.Tech-AI&DS and IT Programmes) | 0 0 2 1 |

**Preamble:**

*This laboratory course is intended to provide students with opportunities to get hands on training to solve Engineering problems using C programming language.*

**LIST OF EXPERIMENTS**

1. If the three sides of a triangle are entered through the keyboard, write a program to check whether the triangle is valid or not. The triangle is valid if the sum of two sides is greater than the largest of the three sides.
2. A university has the following rules for a student to qualify for a degree with A as the main subject and B as the subsidiary subject:
   (a) He should get 55 percent or more in A and 45 percent or more in B.
   (b) If he gets than 55 percent in A he should get 55 percent or more in B. However, he should get at least 45 percent in A.
   (c) If he gets less than 45 percent in B and 65 percent or more in A he is allowed to reappear in an examination in B to qualify.
   (d) In all other cases he is declared to have failed.
   Write a program to receive marks in A and B and Output whether the student has passed, failed or is allowed to reappear in B.
3. Twenty-five numbers are entered from the keyboard into an array. Write a program to find out how many of them are positive, how many are negative, how many are even and how many odd.
4. Write a program that extracts part of the given string from the specified position. For example, if the sting is "Working with strings is fun", then if from position 4, 4 characters are to be extracted then the program should return string as "king". Moreover, if the position from where the string is to be extracted is given and the number of characters to be extracted is 0 then the program should extract entire string from the specified position.
5. A positive integer is entered through the keyboard, write a program to obtain the prime factors of the number. Modify the function suitably to obtain the prime factors recursively.
6. Write a function to compute the distance between two points and use it to develop another function that will compute the area of the triangle whose vertices are A(x1, y1), B(x2, y2), and C(x3, y3). Use these functions to develop a function which returns a value 1 if the point (x, y) lines inside the triangle ABC, otherwise a value 0.
7. An animal could be a canine (dog, wolf, fox, etc.), a feline (cat, lynx, jaguar, etc.), a cetacean (whale, narwhal, etc.) or a marsupial (koala, wombat, etc.). The information whether a particular animal is canine, feline, cetacean, or marsupial is stored in bit number 0, 1, 2 and 3 respectively of a integer variable called type. Bit number 4 of the variable type stores the information about whether the animal is Carnivore or Herbivore. For the following animal, complete the program to determine whether the animal is a herbivore or a carnivore. Also determine whether the animal is a canine, feline, cetacean or a marsupial.
8. There is a structure called employee that holds information like employee code, name, date of joining. Write a program to create an array of the structure and enter some data into it. Then ask the user to enter current date. Display the names of those employees whose tenure is 3 or more than 3 years according to the given current date.
9. Given a list of names of students in a class, write a program to store the names in a file on disk. Make a provision to display the nth name in the list (n is data to be read) and to display all names starting with S.

10. Assume that a Master file contains two fields, Roll no. and name of the student. At the end of the year, a set of students join the class and another set leaves. A Transaction file contains the roll numbers and an appropriate code to add or delete a student. Write a program to create another file that contains the updated list of names and roll numbers. Assume that the Master file and the Transaction file are arranged in ascending order by roll numbers. The updated file should also be in ascending order by roll numbers.

**TOTAL: 45 PERIODS**

**Course Outcomes:**

Upon completion of the course, students will be able to:

CO1 Develop and test the C program to solve a given problem statement using suitable data types, decision making and control statements.

CO2 Develop and test the C program to process the given list or table of data and reproduce the array according to the expected result.

CO3 Develop and test the C program for the given problem statement using structure, union and functions.

CO4 Develop and test the C programs using pointers to access arrays, functions and allocate memory using dynamic memory management functions.

CO5 Develop and test the C programs to store and process the given data using files.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 2 | - | 1 | - | 1 | - | - | 2 | - | - |
| CO2 | 2 | 3 | 3 | 3 | 2 | - | 1 | - | 1 | - | - | 2 | - | - |
| CO3 | 2 | 3 | 3 | 3 | 2 | - | 1 | - | 1 | - | - | 2 | - | - |
| CO4 | 2 | 3 | 3 | 3 | 2 | - | 1 | - | 1 | - | - | 2 | - | - |
| CO5 | 2 | 3 | 3 | 3 | 2 | - | 1 | - | 1 | - | - | 2 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson BoS
Dept of IT VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22EEL22 | ENGINEERING PRACTICES LAB | L T P C |
|---|---|---|
| | (Common to BE - CS, AI &ML,B-Tech- AI&DS and IT Branches) | 0 0 2 1 |

**Preamble:**

*The students are given the introduction upon the basics of computer which comprises of the study of Motherboard and interfacing components and operating system. They were given the practice for assembling a PC, assembling RAM in a motherboard, assembling hard disk drive in a cabinet, assembling CD/DVD ROM in a cabinet, establishing data connection and fixing wires. The basic knowledge of electrical and electronics is mandatory and it is practiced with the wiring experiments and by verification of the basic logic gates.*

**LIST OF EXPERIMENTS**

**COMPUTER**

1) Study and identification of standard desktop personal computer.
2) Study of Motherboard and interfacing components.
3) Install, upgrade and configure Windows operating systems.
4) Install, upgrade and configure Linux operating systems.
5) Computer Assembly and Configuration : Steps for assembling a PC, assembling RAM in a motherboard, assembling hard disk drive in a cabinet, assembling CD/DVD ROM in a cabinet,establishing data connection and fixing wires.
6) System Installation: Steps for installing different softwares (including antivirus software, printer andscanner software).

**ELECTRICAL AND ELECTRONICSELECTRICAL**

7) Residential house wiring using switches, fuse, indicator and lamps.
8) Fluorescent lamp wiring.
9) Stair case wiring.
10) Reading of voltage, current, power, energy and other parameters with 1 phase digital energy meter
11) Measurement of earth resistance

**ELECTRONICS**

12) Identification and Study of Electronic components and equipments – Resistors, capacitors, inductors,colour coding and measurement.
13) Measurement of AC signal parameters (peak-peak, RMS value, period, frequency) using CRO.
14) Verification of the truth tables of logic gates: AND, OR, XOR and NOT.
15) Construction of Half Wave and Full Wave Rectifiers and study their output waveforms.
16) Soldering practice – Using general purpose PCB.

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Study the basics of personal computer and also its interfacing components.
CO2 Install and update windows and Linux operating systems
CO3 Explain basics of Computer assembly and configuration and also system installation with different software.
CO4 Construct various types of domestic wiring and measure the various electrical parameters.
CO5 Develop and test circuits with active elements and verify truth table of logic gates.



Chairperson - BoS
Dept. of EEE - VCET

Chairperson - BoS
Dept. of CSE - VCET

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | 1 | 3 | - | - | 1 | - | 1 | 1 | - | 1 | - | - |
| CO2 | 1 | 2 | 1 | 3 | - | - | 1 | - | 1 | 1 | - | 1 | - | - |
| CO3 | 1 | 2 | 1 | 3 | - | - | 1 | - | 1 | 1 | - | 1 | - | - |
| CO4 | 1 | 2 | 2 | 3 | - | - | 1 | - | 1 | 1 | - | 1 | - | - |
| CO5 | 1 | 2 | 2 | 3 | - | - | 1 | - | 1 | 1 | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High)

| 22MCT03 | ENVIRONMENTAL SCIENCE AND ENGINEERING<br>(Common to all B.E, B.Tech Programmes) | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 0 |

**Preamble**

*The study of biodiversity reflects the level of national interest in natural resources and heritage, which is considered as an important part of a country's wealth. As India is one of the world's 12 giant diversity hubs, we need to focus on understanding, preserving and utilizing the biodiversity of our biological resources. Environmental protection is an important issue for today's society, as scientific research provides evidence of increased global warming, ozone depletion and increased pollution. Engineers need to learn the importance of green synthesis in the design, development and evaluation of structures, devices and systems to provide practical solutions to the problems caused by the pollution and depletion of natural resources.*

**UNIT 1 NATURAL RESOURCES, ECOSYSTEM AND BIODIVERSITY** **6**

Forest Resources – use and over exploitation – Water Resources – use and over utilization – Dams – benefits and problems – Ecosystem – structure and function – Biodiversity – types – threats to biodiversity – Biodiversity conservation–In-situ and Ex-situ – Role of an individual in conservation of natural resources.

**UNIT 2 ENVIRONMENTAL POLLUTION** **6**

Definition – causes, effects and control measures – Air Pollution, Water Pollution, Soil Pollution – Solid waste – methods of disposal – sanitary landfill, incineration and composting – Environmental Impact Assessment and ISO 14000.

**UNIT 3 E-WASTE AND ITS MANAGEMENT** **6**

E-Waste – sources of e-waste – hazardous substances in e-waste – effects of e-waste on environment and human health – need for e-waste management – disposal treatment methods of e-waste – Global scenario of e-waste – e-waste in India- case studies.

**UNIT 4 SOCIAL ISSUES AND THE ENVIRONMENT** **6**

Social issues – Sustainable development – Water conservation – rain water harvesting. Disaster Management – floods, earthquake, cyclone and landslides. Role of IT in environment and human health.

**UNIT 5 GREEN CHEMISTRY** **6**

Green Chemistry – twelve principles of green chemistry – Importance of green synthesis – Green synthesis – dimethyl carbonate – Bio-catalysts – extraction of gold – Applications of green synthesis.

**TOTAL : 30 PERIODS**

**TEXT BOOKS:**


1. Environmental Science, 5th Edition. P. N. Palanisamy, P. Manikandan, A. Geetha, K. Manjula Rani, V. N. Kowshalya, Pearson India Education services Private Limited, 2020.
2. Environmental Science and Engineering, 2nd edition, Dr.T. Arun Luiz , V K publications, 2018.


**REFERENCES:**


1. Environmental Science and Engineering, 3rd reprint, Benny Joseph, McGraw Hill Education (India) Private Limited, New Delhi, 2015.
2. Engineering Chemistry, 1st Impression, K. Sesha Maheswaramma, Mridula Chugh, Pearson India Education Services Private Limited, 2016.
3. Introduction to Environmental Engineering and Science, 2nd edition, Gilbert M. Masters, Prentice Hall of India Private Limited, 2015.


**e-RESOURCES:**

1. https://www.digimat.in/nptel/courses/video/105105169/L01.html , "Electronic waste management-issues and challenges"- Prof. Brajesh Kumar Dubey, Department of Civil Engineering, IIT Kharagpur.
2. https://archive.nptel.ac.in/courses/105/103/105103205/, "Municipal solid waste management"- Prof. Ajay Kalamdhad, Department of Civil Engineering, IIT Guwahati.



Chairperson - BoS
Dept. of Chemistry - VCET

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Recognize the biodiversity threats, overexploitation of forest and overutilization of water to conserve biodiversity.
CO2 Analyze sources, impacts, air and water pollution control measures and solid waste management to maintain a green environment.
CO3 Identify the Environmental impacts of e-waste and its management.
CO4 Explain human health, environment and disaster management through information technology.
CO5 Apply the principles of green chemistry to green synthesis for a sustainable environment.

**Mapping of COs with POs and PSOs**

| COs\POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | - | - |
| CO2 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | - | - |
| CO3 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | - | - |
| CO4 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | - | - |
| CO5 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of Chemistry - VCET

Chairperson - BoS
Dept. of CSE - VCET

| | DISCRETE MATHEMATICS | L | T | P | C |
|---|---|---|---|---|---|
| **22MAT34** | (Common to B.E. Computer Science and Engineering , B.E Artificial Intelligence and Machine Learning, B.Tech Artificial Intelligence and Data Science and B.Tech Information Technology Programmes in third Semester) | 3 | 1 | 0 | 4 |

**Pre-requisites :** 22MAT12-Matrices and Differential Calculus, 22MAT22-Probability and Statistics

*Preamble : Discrete Mathematics is a branch of mathematics involving discrete elements that uses algebra and arithmetic. It is increasingly being applied in the practical fields of computer science. Propositional calculus is a formal system whose expressions represent formal objects which can be used in the design of combinational digital circuits. The predicate logic is a part of artificial intelligence which is applicable in the field of robotics, medicine and it is used in intelligent database in order to solve some complex problems. Combinatorics is a fundamental mathematical discipline which provides a foundation in counting techniques that can be applied to algorithm analysis. Graph is a formal way to represent a network. Many problems in computer system can be analyzed using models based on graphs. Concepts of Groups provide the background essential to the study of finite state machines, switching theory and logic design.*

**UNIT 1 PROPOSITIONAL CALCULUS** **9+3**

Propositions –Logical connectives–Compound propositions-Conditional and biconditional propositions –Truth tables–Tautologies and contradictions–Contra positive–Logical equivalences and implications –Normal forms–Principal conjunctive and disjunctive normal forms–Rules of inference.

**UNIT 2 PREDICATE CALCULUS** **9+3**

Predicates–Statement functions –Variables-Free and bound variables–Quantifiers –Universe of discourse–Logical equivalences and implications for quantified statements–Theory of inference –The rules of universal specification and generalization.

**UNIT 3 COMBINATORICS** **9+3**

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

**UNIT 4 GRAPHS** **9+3**

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

**UNIT 5 GROUP THEORY** **9+3**

Groups – Subgroups – Permutation groups –Normal subgroup and cosets – Lagrange's theorem – Homomorphism –First fundamental theorem of homomorphism- -Cayley's Theorem.

**LECTURE : 45 TUTORIAL : 15 TOTAL : 60 PERIODS**

**TEXT BOOKS:**


1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", 7th Edition, Tata Mc Graw Hill Private Limited, New Delhi, Special Indian Edition, 2014
2. Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata Mc Graw Hill Pub. Co. Ltd, New Delhi, 47th Reprint, 2015.


Chairperson - BoS
Dept. of Maths- VCET

Chairperson - BoS
Dept. of CSE - VCET

**REFERENCES:**


1. Ralph.P.Grimaldi., "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education(Singapore) Private Limited, New Delhi, 8th Impression 2016.
2. Thomas Koshy., "Discrete Mathematics with Applications", Elsevier Academic Press, UK, Reprinted 2014.
3. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Learning Private Limited, Delhi, 2016.
4. Bernard Kolman, Robert Busby, Sharon C. Ross "Discrete Mathematical Structures" 6th Edition,Pearson Education(Singapore) Private Limited, New Delhi, 2014.


**e-RESOURCES:**

1. http://nptel.ac.in/courses/106106094/1, "Propositional Logic" , http://nptel.ac.in/courses/106106094/3, "Predicate Calculus" and https://nptel.ac.in/courses/106106094/40 "Lattices" Dr.Kamala Krithivasan, Department of Computer Science and Engineering, Indian Institute of Technology, Madras.
2. http://nptel.ac.in/courses/111107058/20, "Graph Theory", and http://nptel.ac.in/courses/111107058/38, "Inroduction to Recurrence Relations" , Dr.Sugata Gangopadhyay, Department of Mathematics, Indian Institute of Technology, Roorkee.

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Construct and check the validity of mathematical arguments using propositional calculus

CO2 Compute the logical structures of ordinary language statements using predicate calculus.

CO3 Compute combinatorial problems by applying Pigeonhole Principle, Permutations and Combinations and solve Linear Recurrence Relations using Generating functions

CO4 Determine whether the graphs are Hamiltonian and/or Eulerian and check Isomorphism between graphs

CO5 Classify the given set as Semigroup, Monoid or Group by using the properties of groups.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| **CO 2** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| **CO 3** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| **CO 4** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| **CO 5** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of Maths- VCET

Chairperson
Dept. of CSE - VCET

22AMT31 **ARTIFICIAL INTELLIGENCE** L T P C
3 0 0 3

**Pre-requisites: -**

**Preamble**

*Intelligent machines have replaced human capabilities in many areas. Artificial intelligence is the intelligence exhibited by machines or software. It is the branch of computer science that emphasizes on creating intelligence machines that work and reacts like humans. This course is designed to span a wide variety of topics in computer science research, including machine learning, Game playing, Expert System etc.*

**UNIT 1 INTELLIGENT AGENT** 9

Introduction to AI - Agents and Environments -concept of rationality -nature of environments -structure of agents.Problem solving agents –search algorithms-uninformed search strategies

**UNIT 2 PROBLEM SOLVING** 9

Heuristic search strategies – heuristic functions.Local search and optimization problems- local search in continuous space – search with non-deterministic actions – search in partially observable environments – online search agents and unknown environments.

**UNIT 3 GAME PLAYING AND CSP** 9

Game theory – optimal decision in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP.

**UNIT 4 LOGICAL REASONING** 9

Knowledge-based agents – propositional logic - propositional model checking – agents based on propositionallogic. First-order logic – syntax and semantics – knowledge representation and engineering.

**UNIT 5 PROBABILISTIC REASONING** 9

Acting under uncertainty – Bayesian inference –Naïve Bayes models. Probabilistic reasoning – Bayesiannetworks – casual networks.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, PearsonEducation, 2021.
2. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education,2013

**REFERENCES:**

1. Dan W.Patterson, "Introduction to AI and ES", Pearson Education, 2007
2. Kevin Night,Elaine Rich, and Nair B, "Artificial Intelligence", McGraw Hill,2009
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education ,2006

**e. RESOURCES :**

1. https://nptel.ac.in/courses/106106126, Artificial Intelligence: Search Methods for Problem Solving, IITMadras, Prof. Deepak Khemani
2. https://onlinecourses.nptel.ac.in/noc22_cs56/preview, An Introduction to Artificial Intelligence, by Prof.Mausam, IIT Delhi.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Explain intelligent agent frameworks and search strategies

CO2 Apply problem solving techniques and obtain search spaces for partially defined and unknown environments

CO3 Apply game playing theory and constraint satisfaction problem solving techniques

CO4 Perform logical reasoning and derive inferences using FOL forward chining and backward chining

CO5 Perform probabilistic reasoning under uncertainty using Bayesian inference networks.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 1 | 3 |
| **CO 2** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 1 | 3 |
| **CO 3** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 1 | 3 |
| **CO 4** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 1 | 3 |
| **CO 5** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 1 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMC31 | DATA STRUCTURES | L T P C<br>3 0 2 4 |
|---|---|---|

**Pre-requisites:** - C Programming, C Programming Laboratory

**Preamble**

*A data structure is an arrangement of data in computer's memory in such a way that it could make the data quickly available to the processor for required calculations. A data structure should be seen as a logical concept that must address two fundamental concerns. Lists, arrays, stacks, queues, heaps, trees, and graphs are the more commonly used data structures.*

**UNIT 1 LISTS** **9**

Abstract Data Types (ADT) – List ADT – Array-Based Implementation – Linked List Implementation– Singly Linked Lists- Circularly Linked Lists -Doubly-Linked Lists – Applications of Lists.

**UNIT 2 STACKS AND QUEUES** **9**

Stack ADT – Queue ADT – Circular Queue – Applications of Stacks and Queues

**UNIT 3 TREES** **9**

Preliminaries – Binary Trees – Binary Tree Traversal – Binary Search Trees – Expression Trees - AVL Trees -Binary Heap - Heap Sort.

**UNIT 4 GRAPHS** **9**

Definitions – Graph Traversal – Topological Sort – Shortest Path Algorithms: Unweighted Shortest Paths – Dijikstra's Algorithm – Minimum Spanning Tree – Prim's and Kruskal's Algorithms – Undirected Graphs

**UNIT 5 SEARCHING AND HASHING** **9**

Searching: Linear Search – Binary Search. Hashing – General idea – Hash Function - Separate Chaining – Open Addressing: Linear Probing – Quadratic Probing - Double Hashing

**List of Experiments**

Implement a singly linked list of ordered integers (ascending/descending) with insert, search and displayoperations.

Write a C program to simulate Stack and Queue using array and linked list.

Write a C program to insert, delete and search for a node in a binary search tree.

Write a C program for graph traversals by applying: (a) Breadth First Search. (b) Depth First Search

Write a C program to implement linear search and binary search

**Total : (L:45+P:15) 60 PERIODS**

**TEXT BOOKS:**


1. M.A.Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2015.
2. Richard F. Gilberg, and Behrouz A. Forouzan, "Data Structures –A Pseudo code Approach with C",Second Edition, Thomson Brooks/cole, 2011


**REFERENCES:**


1. Reema Thareja," Data Structures Using C", FirstEdition,OxfordUniversityPress,2011
2. ISRD Group, "Data Structures Using C", First Edition, Mc Graw Hill Education (India) Private Limited,New Delhi, 2007
3. Data Structures through C,Yashwant Kanetkar, BPB Publications 2023.


**e. RESOURCES :**

1. http://www.nptel.ac.in/courses/106102064, Introduction to datastructure, Mr.Varma, IIT Bombay
2. http://nptel.ac.in/courses/106102064,Video Lectures, Data Structures and Algorithms, IIT Delhi



Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Develop list ADT for a given list or table using array and linked list implementation by ensuring theordering of data elements |
| CO2 | Create stack and queue ADT for a given list using array and linked list implementation and apply specific ADT for a given application |
| CO3 | Construct a tree for a given list of data by ensuring tree properties and analyze inorder, preorder, postorder traversal for a constructed tree |
| CO4 | Implement a suitable shortest path algorithm for a given graph such that the sum of the edges weights isminimum |
| CO5 | Apply a suitable searching and hashing algorithm for a given list of data considering the size and ordering of data |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | 1 | - | 1 | 3 | - |
| **CO 2** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | 1 | - | 1 | 3 | - |
| **CO 3** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | 1 | - | 1 | 3 | - |
| **CO 4** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | 1 | - | 1 | 3 | - |
| **CO 5** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | 1 | - | 1 | 3 | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMT32 | OBJECT ORIENTED PROGRAMMING | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites: -**

**Preamble**

*This course focuses on the fundamentals of object-oriented programming and Java programming language. Students will also be able to understand the fundamentals of packages, inheritance, and interfaces. The ability to create Java applications with threads, generic classes, exceptions, and I/O streams will be taught to the students. Additionally, using JAVAFX, students will be able to create graphic user interface applications*

**UNIT 1 INTRODUCTION TO OOP AND JAVA** 9

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

**UNIT 2 INHERITANCE, PACKAGES AND INTERFACES** 9

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

**UNIT 3 EXCEPTION HANDLING AND MULTITHREADING** 9

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

**UNIT 4 I/O, GENERICS, STRING HANDLING** 9

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

**UNIT 5 JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS** 9

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

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Herbert Schildt, "Java: The Complete Reference", 12 th Edition, McGraw Hill Education, New Delhi,2021
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi,2015


**REFERENCES:**


1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018
2. Deitel P and Deitel H, "Java: How to Program", Eleventh Edition, Prentice Hall, 2018
3. Matt Weisfeld, "The Object Oriented Thought Process", Fifth Edition, Addison-Wesley Professional, US,2019.


**e. RESOURCES :**

1. https://archive.nptel.ac.in/courses/106/105/106105191
2. . https://www.w3resource.com/java-tutorial/java-object-oriented-programming.php

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Apply the concepts of classes and objects to solve simple problems

CO2 Develop programs using inheritance, packages and interfaces

CO3 Make use of exception handling mechanisms and multithreaded model to solve real world problems

CO4 Build Java applications with I/O packages, string classes, Collections and generics concepts

CO5 Integrate the concepts of event handling and JavaFX components and controls for developing GUI basedapplications

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 2 | 3 | 1 | 3 | - | - | - | 2 | 1 | 2 | 2 | 3 | 1 |
| **CO 2** | 3 | 2 | 3 | 2 | 1 | - | - | - | 2 | 1 | 2 | 3 | 3 | 1 |
| **CO 3** | 3 | 2 | 1 | 2 | 2 | - | - | - | 2 | 1 | 2 | 2 | 3 | 1 |
| **CO 4** | 3 | 2 | 2 | 2 | 2 | - | - | - | 2 | 1 | 2 | 3 | 3 | 1 |
| **CO 5** | 3 | 2 | 2 | 2 | 2 | - | - | - | 2 | 1 | 2 | 2 | 3 | 1 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMC32 | DIGITAL DESIGN AND COMPUTER ORGANIZATION | L T P C<br>3 0 2 4 |
|---|---|---|

**Pre-requisites: -**

**Preamble**

*This course aims at giving adequate exposure to students on the design of combinational circuits and design sequential circuits. Students can understand the basic structure and operation of a digital computer and the designof data path unit, control unit for processor and to familiarize with the hazards. Students can can also understand the concept of various memories and I/O interfacing.*

**UNIT 1 COMBINATIONAL LOGIC** **9**

Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers.

**UNIT 2 SYNCHRONOUS SEQUENTIAL LOGIC** **9**

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuitimplementation - Registers – Counters.

**UNIT 3 COMPUTER FUNDAMENTALS** **9**

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

**UNIT 4 PROCESSOR** **9**

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Micro programmedControl – Pipelining – Data Hazard – Control Hazards.

**UNIT 5 MEMORY AND I/O** **9**

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.

**LIST OF EXPERIMENTS** **15**

1. Verification of Boolean theorems using logic gates
2. Design and implementation of Half Adder, Full Adder and binary to gray code converter.
3. Design and implementation of multiplexers/ Demultiplexers.
4. Design and implementation of Synchronous counters.
5. Simulator based study of Computer Architecture

**Total : (L:45+P:15) 60 PERIODS**

**TEXT BOOKS:**


1. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL,and System Verilog", Sixth Edition, Pearson Education, 2018
2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/SoftwareInterface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020


**REFERENCES:**


1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Eleventh Edition, Pearson Education, 2021
2. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012

**e. RESOURCES :**

1. Digital Circuits [Prof. Anil Mahanta - IIT Guwahati] http://nptel.ac.in/courses/117103064/#
2. Digital Circuits and Systems [Prof. S. Srinivasan - IIT Madras] http://nptel.ac.in/courses/117106086

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Design various combinational digital circuits using K-map to reduce Boolean expression

CO2 Design sequential circuits and analyze the design procedures to implement shift registers

CO3 Analyze the performance and describe the instruction set using different addressing modes for a givencomputer architecture

CO4 Construct the data path and describe the effect of data hazard, control hazard for a given pipeline processor

CO5 Compare the standard I/O interfaces and data transfer techniques to access I/O devices for the givencomputer system

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | 2 | 1 | - | - | - | 1 | - | - | 1 | 2 | 2 |
| **CO 2** | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | - | - | 1 | 2 | 2 |
| **CO 3** | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | - | - | 1 | 2 | 2 |
| **CO 4** | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | - | - | 1 | 2 | 2 |
| **CO 5** | 3 | 3 | 2 | 2 | 3 | - | - | - | 1 | - | - | 1 | 2 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AML31 | ARTIFICIAL INTELLIGENCE LABORATORY | L T P C<br>0 0 2 1 |
|---|---|---|

**Preamble:**

*The main objective of artificial intelligence lab is to solve problems using AI algorithms*

**LIST OF EXPERIMENTS**

1. Implement a 8 puzzle problem.
2. Write a program to Implement 8 – queens problem
3. Write a program to implement A* algorithm
4. Write a program to implement hill Climbing problem by using local search & Optimization problem
5. Write a program to implement alpha beta pruning
6. Solve suduku - puzzle by using constraint satisfaction problem
7. Write a python code for knowledge representation using propositional logic.
8. Implement propositional model checking using wumpus world problem.
9. Build naive Bayes model.
10. Mini - project

**SOFTWARE**

- Python

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Apply problem solving techniques |
| CO2 | Implement various search techniques |
| CO3 | Apply game playing and CSP techniques. |
| CO4 | Perform logical reasoning |
| CO5 | Build applications using AI concepts |

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| | | L T P C |
|---|---|---|
| 22AML32 | OBJECT ORIENTED PROGRAMMING LABORATORY | 0 0 2 1 |

**Preamble:**
*The goal of the course is to give students the ability to construct software using Java programming for practical applications. The ideas of classes, packages, interfaces, inheritance, exception handling, and file processing will be understood and applied by the students. Students are also capable of creating applications using event handling and general programming.*

**LIST OF EXPERIMENTS**

1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)
2. Develop stack and queue data structures using classes and objects.
3. Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no asmembers. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 %of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.
4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea( ) that prints the area of the given shape.
5. Solve the above problem using an interface.
6. Implement exception handling and creation of user defined exceptions.
7. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
8. Write a program to perform file operations.
9. Develop applications to demonstrate the features of generics classes.
10. Develop applications using JavaFX controls, layouts and menus

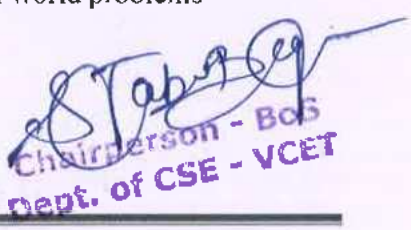
**SOFTWARE**

- Operating Systems: Linux / Windows
- Front End Tools: Eclipse IDE / Netbeans IDE

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Design and develop java programs using object oriented programming concepts |
| CO2 | Develop simple applications using object oriented concepts such as package, exceptions |
| CO3 | Implement multithreading, and generics concepts |
| CO4 | Create GUIs and event driven programming applications for real world problems |
| CO5 | Implement and deploy web applications using Java |



**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of English - VCET

Chairperson - BoS
Dept. of CSE - VCET

| | | |
|---|---|---|
| | **ENGLISH FOR PROFESSIONALS** | **L T P C** |
| **22MCL04** | **(III / IV Semester)** | **0 0 2 0** |
| | **(Students admitted during 2023-2024 onwards)** | |

**Pre-requisites: -**

**Preamble**

*Communicative English is a life skill necessary for all students of Engineering and Technology. The course Essential English for Professionals aims at enabling the learners to communicate effectively and appropriately in professional contexts by exposing them to LSRW tasks.*

**UNIT 1 LISTENING** **5**

Listening to Casual Conversation- Note-Taking on TED Talks – Summarizing

**UNIT 2 READING** **7**

Reading for gist - Biographies of Famous Personalities - Reading and Note Making on News Articles

**UNIT 3 WRITING** **5**

Letter Writing - Seeking Permission- Seeking Apology - Letters Requesting Certificates – Analytical Writing and Issue based writing

**UNIT 4 SPEAKING** **9**

Presentation Techniques - Presentation with visual aids – Extempore and Impromptu talk

**UNIT 5 VERBAL ABILITY** **4**

Parajumbles - Sentence Completion - Identifying Common Errors

**Total : 30 PERIODS**

**TEXT BOOKS:**


1. M Ashraf Rizvi "Effective Technical Communication", Tata McGraw-Hill, 2st Edition, New Delhi, 2018
2. Meenakshi Raman and Sangeetha Sharma., "Technical Communication: English Skills for Engineers"Oxford University Press, 1st Edition, New Delhi, 2008


**e. RESOURCES :**

1. https://agendaweb.org/listening/audio-books-mp3.html
2. https://www.ndtv.com/world-news
3. http://learnenglishteens.britishcouncil.org/skills/reading
4. https://www.bbc.com/

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Analyze the given listening material and answer the questions correctly employing listening techniques. |
| CO2 | Analyze the given reading material and answer the questions correctly employing reading techniques. |
| CO3 | Write within the stipulated time syntactically and semantically correct sentences to present ideas in the form of essays and letters. |
| CO4 | Take part effectively in group discussion, conforming to professional norms and to give extemporaneous presentation. |
| CO5 | Identify within the stipulated time syntactically and semantically correct sentences for a variety of language exercises. |



Chairperson - BoS
Dept. of English - VCET

Chairperson - BoS
Dept. of CSE - VCET

**Mapping of COs with POs and PSOs**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | - | - | - | - | 3 | - | - | - | - | 3 | - | - | - | - |
| CO 2 | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - |
| CO 3 | - | - | - | - | - | - | - | - | 3 | 3 | - | 1 | - | - |
| CO 4 | - | - | - | - | - | - | - | - | 3 | 3 | - | 1 | - | - |
| CO 5 | - | - | - | - | - | - | - | - | - | 3 | - | 1 | - | - |
| Mapping Average | - | - | - | - | 3 | - | - | - | 3 | 3 | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

| 22MAT42 | OPTIMIZATION TECHNIQUES AND QUEUING THEORY<br>(Common to B.E. Computer Science and Engineering , B.E Artificial Intelligence and Machine Learning, B.Tech Artificial Intelligence and Data Science and B.Tech Information Technology Programmes) | L T P C<br>3 1 0 4 |
|---|---|---|

**Pre-requisites:-** 22MAT12-Matrices and Differential Calculus , 22MAT22- Probability and Statistics

**Preamble**

*Optimization Techniques is a discipline to aid decision making and improving efficiency of the system by applying advanced analytical methods. Simplex Algorithm is a powerful method for solving linear programming problems. The Transportation and Assignment problems deal with assigning sources and jobs to destinations and machines and minimize the Transportation cost. PERT and CPM are techniques of project management useful in the basic managerial functions of planning, scheduling and control. Queuing theory provides a rich and useful set of mathematical models for the analysis and design of service process for which there is contention for shared resources.*

**UNIT 1 LINEAR PROGRAMMING PROBLEM** 9+3

Introduction to Optimization Techniques,General mathematical formulation for Linear Programming Problem- Canonical and Standard form of LPP,Solution of LPP by graphical Method, simplex method and Big-M method

**UNIT 2 TRANSPORTATION AND ASSIGNMENT PROBLEM** 9+3

Transportation Models– Balanced and unbalanced Problems – Initial Basic feasible solution by N-W Corner Rule, Least cost and Vogel's approximation methods. Check for optimality. Solution by MODI method. Case of Degeneracy. Assignment Models – Balanced and Unbalanced Problems. Solution by Hungarian method

**UNIT 3 NETWORK MODELS** 9+3

Introduction - determining the critical path, project scheduling by Critical Method (CPM),Programme Evaluationand Review Technique (PERT).

**UNIT 4 QUEUEING THEORY** 9+3

Markovian queues – Single server with infinite capacity–Multiple server with infinite capacity – Single server withfinite capacity – Multiple server with finite capacity –Little's formula.

**UNIT 5 ADVANCED QUEUEING MODELS** 9+3

M/G/1 queue – PollaczekKhinchin formula - M/D/1 and M/EK/1 as special cases – Series queues withoutblocking – Open Jackson networks.

**Total : (L:45+P:15) 60 PERIODS**

**TEXT BOOKS:**


1. Hamdy A.Taha, "Operations Research", 9th Edition, Pearson Prentice Hall , Chennai,2013
2. D.Gross,JohnF.Shortle, James M.Thompson and C.M.Harris,"Fundamentals of Queueing Theory", WileyIndia Pvt Ltd,4thReprint,2013


**REFERENCES:**


1. A. Ravindran, Don T. Phillips, James J. Solberg, "Operations Research: Principles and Practice", 2nd Edition, Wiley India Edition, New Delhi, 2007
2. Trivedi.K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications",2nd Edition, Wiley Dream Tech. India (P) Ltd,New Delhi,2013

**e. RESOURCES :**

1. https://onlinecourses.nptel.ac.in/noc22_ma48/preview "OPERATION RESEARCH " by Dr. Kusum Deep, Department of Mathematics, Indian Institute of Technology Roorkee, India
2. http://nptel.ac.in/courses/112106131/30"Queueing Models",Prof. G. Srinivasan, Department of Management Studies Indian Institute of Technology,Chennai

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Formulate the LPP and solve the LPP using graphical method, simplex method and Big M method. |
| CO2 | Solve Balanced and Unbalanced transportation and assignment Problems and get the optimal solutions. |
| CO3 | Construct and use the terminology of project management (PM) as established by CPM and PERT. |
| CO4 | Identify and solve the queueing systems with finite and infinite population using Markovian queueing models. |
| CO5 | Identify and solve the Non Markovian queueing system, series queues and Open Jackson Networks usingMarkovian queueing models. |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO4 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| CO5 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).



Chairperson - BoS
Dept. of Maths- VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22AMC41 | DATABASE MANAGEMENT SYSTEMS | L T P C<br>3 0 2 4 |
|---|---|---|

**Pre-requisites:-**

**Preamble**

*The course aims to provide an understanding about the fundamentals of database, database system architecture and various database design technique. It also helps to familiarize SQL standards and various SQL operations. An overview of normalization, query optimization and transaction management is also provided.*

**UNIT 1 DATABASE SYSTEMS** **9**

Overview of File processing system- Purpose of Database System-Views of data–Data Models–DatabaseLanguages—Database System Architecture–Database users and Administrator.

**UNIT 2 DATABASE DESIGN** **9**

Database design & E-R Model: Entity–Relationship model (E-R model)–E-R Diagrams-Constraints-Extended E- R features. Introduction to Relational Model: Database schema–Keys- Schema Diagrams – Relational Query languages – Relational Operations

**UNIT 3 SQL** **9**

SQL Standards-Data types–structure of SQL queries–additional basic operations-set operations-null values- aggregate functions-nested sub queries-modification of the database. Intermediate SQL: Joins-Views- Transactions-Integrity constraints–Authorization. Advanced SQL

**UNIT 4 NORMALIZATION AND QUERY OPTIMIZATION** **9**

Relational database design: Functional Dependencies -Normalization and its normal forms-Denormalization- DataStorage: RAID – Tertiary Storage – File organization – Organization of records in files. Query Processing - Query optimization

**UNIT 5 TRANSACTION MANAGEMENT** **9**

Transaction concepts- Transaction recovery-Properties of Transaction-Serializability-Concurrency Control – Locking Mechanisms-Two Phase Commit Protocol-Dead lock. Case study: Database connectivity using SQL,Introduction to Mongo DB

**LIST OF EXPERIMENTS** **15**

1. Create a database Employee and work with SQL queries to retrieve information from Employee database andset various constraints on it.
2. Work with Joins, aggregate functions, Triggers and Exception handling
3. Creation of database objects: Synonyms, Sequences, Views, Indexes and save point.
4. Develop simple programs using PL/SQL to implement Procedures and Functions.
   Mini project (Application Development using Oracle / MySQL.
5. Create a database Employee and work with SQL queries to retrieve information from Employee database andset various constraints on it.

**Total : (L:45+P:15) 60 PERIODS**

**TEXT BOOKS:**


1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth Edition, TataMcGraw Hill, 2011


**REFERENCES:**


1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition,PearsonEducation, 2006.
2. RamezElmasri,ShamkantB.Navathe,"FundamentalsofDatabaseSystems",EighthEdition,Pearson/Addisionwesley,2017.
3. AtulKahate," Introduction to DatabaseManagementSystems",PearsonEducation,NewDelhi,2011.

**e. RESOURCES :**

1. http://www.nptelvideos.in/2012/11/database-management-system.html, Database Management Systems,Dr.S.Srinath, IIT Madras.

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Compare File processing system with Database systems in terms of performance, scalability and datastorage for efficient access of data.

CO2 Design a database schema using E-R model, Relational model and apply relational algebra operations like selection, projection, join and Cartesian product to solve the given problem.

CO3 Develop SQL queries using aggregate functions, nested sub queries, joins and views for the givenproblem.

CO4 Apply suitable normalization and query optimization techniques to normalize the give relation and tooptimize the query for efficient access of data.

CO5 Discuss serialization and concurrency control mechanisms to avoid deadlock problem in transaction processing.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | 1 | 2 | 2 |
| **CO2** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 2 | 2 |
| **CO3** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 2 | 2 |
| **CO4** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 2 | 2 |
| **CO5** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 1 | 1 | 2 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMT41 | DESIGN AND ANALYSIS OF ALGORITHMS | L T P C<br>3 1 0 4 |
|---|---|---|

**Pre-requisites:-** Probability and Statistics, Data Structures using Python.

**Preamble**

*This course enables the student to understand various algorithm design techniques, and know how to apply those techniques to various problems. The analysis of various algorithms can be performed and select the best algorithmfor solving a problem.*

**UNIT 1 ALGORITHM ANALYSIS** **9+3**

Introduction – Notion of Algorithm – Fundamentals of Algorithmic problem Solving – Important Problem types –Fundamentals of the Analysis of Algorithm Efficiency - Analysis Framework – Asymptotic notations and Basic Efficiency Classes - Mathematical Analysis of Recursive and Non-recursive algorithms - Empirical analysis of Algorithms-Algorithm Visualization.

**UNIT 2** **9+3**

Brute Force: Selection and Bubble Sort, Sequential search – closest pair and convex hull problem. DivideandConquer: Merge sort – Quick sort – Strassen's Matrix Multiplication – closest pair and convex hull problem.

**UNIT 3 BRUTE FORCE AND DIVIDE & CONQUER** **9+3**

Decrease and Conquer: Insertion Sort – Binary search – Computing a Median and the Selection Problem. Transform and Conquer: Presorting – Balanced search trees – AVL trees - 2-3 Trees - Heaps and Heap sort.

**UNIT 4 DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE** **9+3**

Introduction to Dynamic Programming - Warshall's and Floyd's Algorithms - Optimal Binary Search Trees – 0/1Knapsack Problem and Memory functions. Introduction to Greedy Technique – Prim's algorithm – Kruskal's algorithm – Dijkstra's algorithm - Huffman Trees.

**UNIT 5 BACKTRACKING & BRANCH AND BOUND** **9+3**

Backtracking: n-Queens problem - Hamiltonian Circuit Problem - Subset Sum problem. Branch and Bound: 0/1Knapsack problem - Traveling Salesman Problem. Introduction to P, NP and NP-complete Problems.

**Total : 60 PERIODS**

**TEXT BOOKS:**

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

**REFERENCES:**

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Second edition, Galgotia Publications, New Delhi, 2010.
2. DonaldE.Knuth,"TheArtofComputerProgramming",PearsonEducation,2011.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms",PearsonEducation, Reprint 2006.\

**e. RESOURCES :**

1. https://nptel.ac.in/courses/106101060/ "Design and Analysis of Algorithms", Prof. AbhiramRanade,IITBombay.
2. http://nptel.ac.in/courses/106106131/, "Design and Analysis of Algorithms", Prof.MadhavanMukund,IITMadras.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Differentiate recursive and non-recursive algorithms using asymptotic notations. |
| CO2 | Evaluate the performance of Selection sort, Bubble sort, Merge sort and Quick sort considering input data set properties, running time and code size. |
| CO3 | Implement and analyze the problems using Decrease & Conquer and Transform & Conquer techniques. |
| CO4 | Analyze the efficiency of solving graphical problems using dynamic programming and greedy technique |
| CO5 | Illustrate the design strategies to solve various combinatorial problems with backtracking and branch& bound techniques |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 2 | 2 | - | - | 1 | - | - | - | 1 | 1 | 3 | 2 |
| **CO2** | 2 | 3 | 2 | 2 | - | - | 1 | - | - | - | 1 | 1 | 3 | 2 |
| **CO3** | 2 | 3 | 2 | 2 | - | - | 1 | - | - | - | 1 | 1 | 3 | 2 |
| **CO4** | 2 | 3 | 2 | 2 | - | - | 1 | - | - | - | 1 | 1 | 3 | 2 |
| **CO5** | 2 | 3 | 2 | 2 | - | - | 1 | - | - | - | 1 | 1 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).



Chairperson - BoS
Dept. of CSE - VCET

| 22AMC42 | OPERATING SYSTEMS | L T P C<br>3 0 2 4 |
|---|---|---|

**Pre-requisites:-** C Programming

**Preamble**

*The main aim of this course is to introduce the concepts of operating system abstractions, mechanisms and implementations. The course makes the students to develop the optimal solution for CPU scheduling, synchronization problems and deadlocks. This course will enable the students to apply the appropriate memory, file and disk management technique for effective resource utilization..*

**UNIT 1 INTRODUCTION** 7

Computer System - Elements and organization; Operating System Overview - Objectives and Functions -Evolution of Operating System; Operating System Structures – Operating System Services – User OperatingSystem Interface - System Calls – System Programs - Design and Implementation - Structuringmethods. CaseStudy: Linux Process and Thread Management.

**UNIT 2 PROCESS MANAGEMENT** 11

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multithread Models – Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock – Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

**UNIT 3 MEMORY MANAGEMENT** 10

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

**UNIT 4 STORAGE MANAGEMENT, FILE & I/O SYSTEMS** 10

Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods- Free Space Management; I/O Systems – I/O Hardware, Application I/O interface,Kernel I/O subsystem.

**UNIT 5 VIRTUAL MACHINES AND MOBILE OS** 7

Virtual Machines and Docker – History, Benefits and Features, Building Blocks, Types of Virtual Machines and theirImplementations, Virtual Machine Vs Docker -Virtualization and Operating System Components;Mobile OS – iOS Vs Android.

**List of Experiments**

1. Study and execute the basic commands of UNIX operating system for resource management.
2. Write a C program to implement FCFS, SJF and Round Robin (time quantum=2) CPUscheduling algorithms for process Scheduling.
3. Write a C program to implement the FIFO and LRU page replacement algorithm for thefollowingreference string:1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6.
4. Write a C program to implement single and two-level directory structure for effective file organization.
5. Write a C program to create 2 threads named Th1 and Th2 and establish synchronizationbetween two threads using mutex lock.

**Total : (L:45+P:15) 60 PERIODS**

**TEXT BOOKS:**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10thEdition, John Wiley and Sons Inc., 2018
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition,2022 New Delhi.

**REFERENCES:**

1. Ramaz Elmasri, A. Gil Carrick, David Levine, " Operating Systems – A Spiral Approach", McGrawHill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7 th Edition, Prentice Hall,2018
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

**e. RESOURCES :**

1. http://nptel.ac.in/courses/106108101/ "Introduction to operating system", Prof P.C.P. Bhatt , IISc-Bangalore.
2. https://nptel.ac.in/courses/106106144/2/ "Introduction to operating system", Prof Chester Rebeiro,IIT-Madras.

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| **CO1** | Outline the structure and functions of Operating Systems for multiuser environment consideringLinuxprocess and thread management as a case study. |
| **CO2** | Evaluate the FIFO, SJF, Priority scheduling, Round Robin process scheduling algorithms for agiven set of process considering the arrival time, burst time and resources. |
| **CO3** | Analyze the memory allocation techniques and page replacement algorithms for a given reference strings with minimum page fault. |
| **CO4** | Evaluate the FIFO, SSTF, SCAN, CSCAN, LOOK, CLOOK disk scheduling algorithms withminimum seek time for a given disk request and analyze file allocation methods for efficient file organization |
| **CO5** | Explain the functionality of Virtualization and compare iOS and Android Operating Systems. |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO 2** | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO 3** | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO 4** | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO 5** | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMT42 | FOUNDATIONS OF DATA SCIENCE | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites:-** Python Programming

**Preamble**

*The main objective of data science is to discover patterns in data. It makes sense of the data through a variety of statistical techniques. After data extraction, wrangling, and pre-processing, a data scientist must carefully examine the data*

**UNIT 1 INTRODUCTION** **9**

Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and buildingapplications - Data Mining - Data Warehousing – Basic Statistical descriptions of Data.

**UNIT 2 DESCRIBING DATA** **9**

Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data withAverages- Describing Variability - Normal Distributions and Standard (z) Scores.

**UNIT 3 DESCRIBING RELATIONSHIPS** **9**

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean.

**UNIT 4 PYTHON LIBRARIES FOR DATA WRANGLING** **9**

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation andgrouping – pivot tables.

**UNIT 5 DATA VISUALIZATION** **9**

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensionalplotting - Geographic Data with Basemap - Visualization with Seaborn.

**Total : 45 PERIODS**

**TEXT BOOKS:**


1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", ManningPublications, 2016.
2. RobertS.WitteandJohnS.Witte,"Statistics",EleventhEdition,WileyPublications,2021


**REFERENCES:**


1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.
2. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016


**e. RESOURCES :**

1. https://nptel.ac.in/courses/106106179, Data Science for Engineers, by Prof. Shankar Narasimhan, Prof.Ragunathan Rengasamy, IIT Madras
2. https://www.coursera.org/learn/foundations-of-data-science

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Interpret data science basics, exploratory data analysis and its tools.

CO2 Understand different types of data description for data science process.

CO3 Demonstrate the usage of statistical inference and regression models.

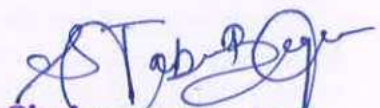
CO4 Use the Python Libraries for Data Wrangling.

CO5 Apply visualization Libraries in Python to interpret and explore data.

**Mapping of COs with POs and PSO**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 2 | 1 | - | - | 1 | - | 1 | 1 | 2 | 3 |
| **CO2** | 3 | 3 | 2 | 2 | 2 | 1 | - | - | 1 | - | 2 | 1 | 2 | 3 |
| **CO3** | 3 | 3 | 2 | 2 | 2 | 1 | - | - | 1 | - | 2 | 1 | 2 | 3 |
| **CO4** | 3 | 3 | 2 | 2 | 3 | 1 | - | - | 2 | - | 3 | 1 | 2 | 3 |
| **CO5** | 3 | 3 | 2 | 2 | 3 | 1 | - | - | 2 | - | 3 | 1 | 2 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).



| 22AMT43 | MACHINE LEARNING | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites:-** Foundation of Data Science

**Preamble**

*The course provides the concepts and algorithms in machine learning and the methods to apply them inreal time problems.*

**UNIT 1 MACHINE LEARNING LANDSCAPE** **9**

Machine learning – Need of machine learning – Machine Learning Applications – Types of Machine Learning systems – Challenges – Machine Learning Process – Data Collection, Exploration, Preparation, Training, Optimization- Performance Measures.

**UNIT 2 SUPERVISED LEARNING - I** **9**

Classification and Regression Technique – Linear regression – Polynomial Regression, Logistic Regression –Generalization – Overfitting – Underfitting – Support Vector Machine – Kernels – KNN – Naïve bayes classifiers– Decision Tree.

**UNIT 3 SUPERVISED LEARNING - II** **9**

Random Forest – Ensemble Learning – Bagging – Boosting – Ada Boost – Gradient Boosting – Neural Networks– Biological Neurons – logical computation with neurons – ANN – Perception – MLPs and Backpropagation –Hyperparameter Optimization – Dimensionality Reduction.

**UNIT 4 UNSUPERVISED LEARNING** **9**

Clustering – Techniques – K-Means Clustering – AGNES – DIANA – Density Based Clustering (DBSCAN) –Grid based clustering – Gaussian Mixtures – Clustering High Dimensional Data – Outlier Analysis.

**UNIT 5 MACHINE LEARNING APPLICATIONS** **9**

Dimensionality Reduction Applications – Factor Analysis – Model selection & evaluation – Optimization of turning parameters – Visualization of results – Contemporary Issues – Case Studies – Application of ML – Medical science, Fraud Detection, Traffic prediction, personal Assistant, Stock Prediction.

**Total : 45 PERIODS**

**TEXT BOOKS:**


1. Muller, Andreas C., and Sarah Guido. Introduction to machine learning with Python: a guide for datascientists. Third edition, "O'Reilly Media, Inc.", 2016.
2. RobertS.WitteandJohnS.Witte,"Statistics",EleventhEdition,WileyPublications,2021 Geron, Aurelien. Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow: Concepts, tools,and techniques to build intelligent systems. First edition, O'Reilly Media, 2019


**REFERENCES:**


1. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Funny Systems with Python: With Case Studies andApplications from the Industry, third edition,2019.
2. Leonardo De Marchi, Hands-On Neural Networks: Learn how to Build and Train Your First NeuralNetwork Model Using Python Book, First edition,2019.
3. James Loy, Neural Network Projects with Python: The ultimate guide to using Python to explore the truepower of neural networks through six projects First edition, Kindle Edition,2019.


**e. RESOURCES :**

1. https://nptel.ac.in/courses/106106139&sa=D&source=editors&ust=1707130049800751&usg=AOvVaw2d 9EWfmJktE7xjZKPofxQb
2. https://nptel.ac.in/courses/106106198/&sa=D&source=editors&ust=1707130049787713&usg=AOvVaw2 nM5G_nNVaI1nqBFS9VI5Z

Chairperson – BoS
Dept. of CSE – VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Describe the fundamental concepts of machine learning.
CO2 Illustrate the classification and regression.
CO3 Examine the concepts of neural networks and ensemble learning.
CO4 Examine the concepts of neural networks and ensemble learning.
CO5 Describe the applications of machine learning.

**Mapping of COs with POs and PSO**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | - | - | - | - | - | - | - | - | - | 1 | 2 | 2 |
| CO2 | 3 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 2 | 2 |
| CO3 | 3 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 2 | 2 |
| CO4 | 3 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 2 | 1 | - | - | - | - | - | - | 1 | 2 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AML41 | DATA SCIENCE LABORATORY | L T P C<br>0 0 2 1 |
|---|---|---|

**Preamble:**

*The main objective of data science lab is to understand the python libraries and basic Statistical and Probabilitymeasures for data science.*

**LIST OF EXPERIMENTS**

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels andPandas packages.
2. Working with Numpy arrays
3. Working with Pandas data frames
4. Reading data from text files, Excel and the web and exploring various commands for doingdescriptive analytics on the Iris data set.
5. Working with aggregate functions in Pandas
6. Working with Group by,Merge and join function in pandas
7. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing thefollowing:
   a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation,Skewness and Kurtosis.
   b. Bivariate analysis: Linear and logistic regression modeling
   c. Multiple Regression analysis
   d. Also compare the results of the above analysis for the two data sets.
8. Apply and explore various plotting functions on UCI data sets.
   a. Normal curves
   b. Density and contour plots
   c. Correlation and scatter plots
   d. Histograms
   e. Three dimensional plotting
9. Visualizing Geographic Data with Basemap

**SOFTWARE**

- Python 3 interpreter / open source IDE

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Make use of the python libraries for data science |
| CO2 | Make use of the basic Statistical and Probability measures for data science. |
| CO3 | Perform descriptive analytics on the benchmark data sets. |
| CO4 | Perform correlation and regression analytics on standard data sets |
| CO5 | Present and interpret data using visualization packages in Python. |

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High)

Chairperson - BoS
Dept. of CSE - VCET

| 22AML42 | MACHINE LEARNING LABORATORY | L T P C<br>0 0 2 1 |
|---|---|---|

**Pre-requisites:-** Python Programming

**Preamble:**

*The main objective of machine learning lab is to understand supervised and unsupervised algorithms*

**LIST OF EXPERIMENTS**

1. Implement Simple and Multiple Linear Regression Models
2. Develop Logistic Regression Model for a given dataset.
3. Implement Naïve Bayes Classification in Python
4. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
5. Build KNN Classification model for a given dataset.
6. Build Artificial Neural Network model with back propagation on a given dataset.
7. Implement Random forest ensemble method on a given dataset
8. Implement Boosting ensemble method on a given dataset
9. Write a python program to implement K-Means clustering Algorithm
10. Implement Dimensionality reduction using Principle Component Analysis (PCA) method

**SOFTWARE**

- Python

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Implement supervised machine learning algorithms on standard datasets and evaluate the performance. |
| CO2 | Apply unsupervised machine learning algorithms on standard datasets and evaluate the performance. |
| CO3 | Assess and compare the performance of different ML algorithms and select the suitable one based on the application. |
| CO4 | Build ensemble models for standard data sets |
| CO5 | Apply suitable Algorithms for dimensionality reduction |

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMT51 | OBJECT ORIENTED SOFTWARE ENGINEERING | L T P C<br>3 1 0 4 |
|---|---|---|

**Pre-requisites :**NIL

**Preamble :**

*Primary aim of the course is to introduce learners with essentials of agile principles ,scrum and devops concepts. The essentials cover agile software development,agile scrum framework and devops framework and site reliability engineering*

**UNIT 1 AGILE PRINCIPLES** **9**

Fundamentals of Agile Process: Introduction and background, Agile Manifesto and Principles, Stakeholders and Challenges, Overview of Agile Development Models: Scrum, Extreme Programming, Feature Driven Development, Crystal, Kanban, and Lean Software Development.

**UNIT 2 AGILE SCRUM FRAMEWORK** **9**

Introduction to Scrum: Agile Scrum Framework, Scrum Artifacts, Meetings, Activities and Roles, Scrum Team Simulation, Scrum Planning Principles, Product and Release Planning, Sprinting: Planning, Execution, Review and Retrospective; User story definition and Characteristics, Acceptance tests and Verifying stories, Burn down chart, Daily scrum, Scrum Case Study.

**UNIT 3 INTRODUCTION TO DEVOPS** **9**

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github..

**UNIT 4 CONTINUOUS INTEGRATION USING JENKINS** **9**

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

**UNIT 5 BASICS OF SITE RELIABILITY ENGINEERING** **9**

Introduction, principle of SRE-SRE roles and responsibilities,SRE implementation

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Andrew Stellman and Jennifer Greene, "Learning Agile: Understanding Scrum, XP, Lean and Kanban", 1st Edition, O'Reilly Media Inc, 2021.
2. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.
3. Stephen Fleming, DevOps and Site Reliability Engineering (SRE) Handbook: Non-Programmer's Guide Paperback – Import, 23 November 2018.


**REFERENCES:**


1. Robert C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, 2013.
2. Kenneth S. Rubin, Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison Wesley, 2012.
3. Cohn, Mike, User Stories Applied: For Agile Software Development Addison Wisley, 2009


**e. RESOURCES :**

1. https://www.jenkins.io/user-handbook.pdf
2. https://www.linkedin.com/learning/site-reliability-engineering-service-level-agreements-and-objectives.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Describe the fundamental principles and practices associated with each of the agile development methods

CO2 Use techniques and skills to establish and mentor Agile Teams for effective software development

CO3 Understand different actions performed through Version control tools like Git to make comparisons in different code versions

CO4 Perform Continuous Integration, Testing and Deployment using Jenkins

CO5 Understanding Basics Concept of SRE to ensure their software applications remain reliable

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 3 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 3 |
| CO4 | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMT52 | THEORY OF COMPUTATION | L T P C<br>3 1 0 4 |
|---|---|---|

**Pre-requisites:-** Nil

**Preamble :**

*The course aims to familiarize the various Computing models like Finite State Machine, Pushdown Automata andTuring Machine and impart the knowledge in types of grammars.*

**UNIT 1 AUTOMATA** **9+3**

Formal proof – Additional forms of proof – Inductive proofs –Finite Automata (FA) –Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions.

**UNIT 2 REGULAR EXPRESSIONS AND LANGUAGES** **9+3**

Regular Expression – FA and Regular Expressions – Moore machine andMealy machine-Closure properties of regular languages – Equivalence and minimization of Automata - Pumping Lemma for Regular sets.

**UNIT 3 GRAMMARS** **9+3**

Grammar Introduction– Types of Grammar - Context Free Grammars and Languages– Parse Trees – Ambiguity in grammars and languages - Relationship between derivation and derivation trees – Normal forms for CFG : Elimination of Useless symbols - Unit productions - Null productions – Chomsky normal form- Greibach Normal form .

**UNIT 4 PUSHDOWN AUTOMATA AND TURING MACHINES** **9+3**

Pushdown automata – Languages of a Pushdown Automata –Equivalence of Pushdown automata and CFG– Deterministic Pushdown Automata -Pumping Lemma for CFL–Closure properties of CFL – Turing Machines – Programming Techniques for TM.

**UNIT 5 DECIDABILITY AND UNDECIDABILITY** **9+3**

A Language that is not recursively enumerable(RE)- An undecidable program that is RE-UndecidableProblems about Turing Machines- Post's Correspondence Problem-The classes P and NP. Case Study:Pattern matching formobilephone, gmail.

**TOTAL: (L:45+T:15) 60 PERIODS**

**TEXT BOOKS:**


1. Hopcroft J.E., Motwani.R and Ullman. J.D., "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2012.
2. Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation", Second Edition,Prentice Hall of India, Pearson Education, New Delhi, 2015.


**REFERENCES:**


1. MichealSipser, "Introduction to Theory of Computation", Cengage Learning India Private Limited, 2012.
2. Mishra K.L.P and Chandrasekaran N, "Theory of Computer Science - Automata, Languages andComputation", Third Edition, Prentice Hall of India Learning India Private Limited,2009.
3. Kamala Krithivasan and Rama. R, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education, 2011.


**e. RESOURCES :**

1. http://nptel.ac.in/courses/ 106104148, Theory of Computation, RaghunathTewari, IIT Kanpur.
2. Handouts:https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-045jautomata-computability-and-complexity-spring-2011/lecture-notes/

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Translate the given FA into deterministic and non-deterministic finite automata using Minimization Techniques. |
| CO2 | Examine the given language is regular or not using Pumping Lemma and Minimization technique. |
| CO3 | Formulate Chomsky and Greibach Normal form for the given regular expression using simplification Techniques. |
| CO4 | Construct pushdown automata for the given Context Free Grammar or Context Free Languageusing Pumping Lemma technique. |
| CO5 | Apply programming techniques involved in turing machine to solve decidable and undecidable problems to achieve efficiency. |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | - | 2 |
| **CO 2** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | - | 2 |
| **CO 3** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | - | 2 |
| **CO 4** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | - | 2 |
| **CO 5** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | - | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMT53 | DEEP LEARNING | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites :** Machine Learning

**Preamble :**

In this course, students will learn an intuitive approach to build complex models that help machines and solve real-world problems with human-like intelligence.

**UNIT 1 DEEP NETWORKS BASICS** **9**

Linear Algebra: Scalars – Vectors - Matrices and tensors. Probability Distributions- Gradient - based Optimization- Machine Learning Basics: Capacity - Overfitting and underfitting- Hyperparameters and validation sets - Estimators - Bias and variance - Stochastic gradient descent - Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization – Optimization.

**UNIT 2 CONVOLUTIONAL NEURAL NETWORKS** **9**

Convolution Operation - Sparse Interactions - Parameter Sharing - Equivariance – Pooling - Convolution Variants: Strided – Tiled - Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions - - Loss Functions - Regularization - Optimizers - Gradient Computation.

**UNIT 3 RECURRENT NEURAL NETWORKS** **9**

Unfolding Graphs - RNN Design Patterns: Acceptor - Encoder - Transducer; Gradient Computation - Sequence Modeling Conditioned on Contexts - Bidirectional RNN - Sequence to Sequence RNN – Deep Recurrent Networks - Recursive Neural Networks - Long Term Dependencies; Leaky Units: Skip connections and dropouts; Gated Architecture: LSTM.

**UNIT 4 MODEL EVALUATION** **9**

Performance metrics-Baseline Models -Hyperparameters: Manual Hyperparameter - AutomaticHyperparameter -Grid search - Random search - Debugging strategies.

**UNIT 5 AUTO ENCODERS AND GENERATIVE MODELS** **9**

Autoencoders: Undercomplete autoencoders -- Regularized autoencoders -- Stochastic encoders and decoders -- Learning with autoencoders; Deep Generative Models: Variational autoencoders – Generative adversarial networks.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning", MIT Press, 2016
2. Andrew Glassner, "Deep Learning: A Visual Approach", No Starch Press, 2021.


**REFERENCES:**


1. Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, ``A Guide toConvolutional Neural Networks for Computer Vision", Synthesis Lectures on Computer Vision, Morgan &Claypool publishers, 2018
2. Neural Networks and Deep Learning, Michael Nielsen, Online, 2016.
3. Learning Deep Architectures for AI, Yoshua Bengio, First Edition, NOW Publishers, 2009.
4. Yoav Goldberg, ``Neural Network Methods for Natural Language Processing", Synthesis Lectures onHuman Language Technologies, Morgan & Claypool publishers, 2017


**e. RESOURCES :**

1. https://onlinecourses.nptel.ac.in/noc20_cs62/preview - Deep Learning by Prof.Prabir Kumar Biswas
2. https://onlinecourses.nptel.ac.in/noc23_ee87/preview-Machine Learning And Deep Learning - Fundamentals And Applications by Prof. M. K. Bhuyan, IIT Guwahati

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Apply the mathematical foundations for comprehending Deep Learning concepts.
CO2 Design and implement various deep learning models and architectures.
CO3 Apply deep learning techniques to create efficient algorithms for real-world applications
CO4 Evaluate machine learning models for various real world applications.
CO5 Implement auto encoders and deep generative models for data generation in various applications.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 3 | - |
| CO2 | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 2 | 3 | - |
| CO3 | 2 | 3 | 3 | 2 | 2 | - | 1 | - | - | - | - | 3 | 2 | 3 |
| CO4 | 2 | 3 | 2 | 3 | 3 | - | 1 | - | - | - | - | 3 | 2 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | 3 | 3 | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AML51 | DATA VISUALIZATION LABORATORY | L T P C<br>0 0 2 1 |
|---|---|---|

**Preamble:**

*The main objective of data visualization lab is to work with the data visualization tool tableau and createdashboards and stories using it*

**LIST OF EXPERIMENTS**

1. Introduction to tableau and Installation
2. Connecting to data and preparing data for visualization in Tableau
3. Apply data aggregation and statistical functions in tableau
4. Create groups,sets and generate basic reports in tableau
5. Perform join ,blend and union operations using tableau
6. Create various charts using tableau
7. Create reports using tableau customized table calculations and filters
8. Customize and create dual layer maps using tableau
9. Create dashboards in tableau
10. Create data story and write a narrative to accompany your visualizations

**SOFTWARE**

- Tableau

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Choose different ways to connect to data and prepare it for visualization |
| CO2 | Make use of the data aggregation and statistical functions in tableau. |
| CO3 | Create data visualization using tableau. |
| CO4 | Build reports using various customized features in tableau |
| CO5 | Develop dashboard and create stories using various features in tableau |

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AML52 | DEEP LEARNING LABORATORY | L T P C<br>0 0 2 1 |
|---|---|---|

**Preamble:**
*The Main objective is to understand the tools and techniques to implement deep neural networks and applydifferent deep learning architectures for solving problems.*

**LIST OF EXPERIMENTS**

1. XOR Challenge:-Deep Learning for Nonlinear Problems
2. Character recognition using CNN
3. Face recognition using CNN
4. Language modeling using RNN
5. Sentiment analysis using LSTM
6. Parts of speech tagging using Sequence to Sequence architecture
7. Machine Translation using Encoder-Decoder model
8. Image augmentation using GANs
9. Mini-project on real world applications

**SOFTWARE**

- Python 3 interpreter / open source IDE

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Apply deep neural network for non linear problems |
| CO2 | Apply Convolution Neural Network for image processing. |
| CO3 | Apply Recurrent Neural Network and LSTM for text analysis |
| CO4 | Apply generative models for data augmentation |
| CO5 | Develop real-world solution using suitable develop neural networks |

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

| 22MCT05 | APTITUDE AND LOGICAL REASONING | L T P C<br>2 0 0 0 |
|---|---|---|

**Preamble :**

*Aptitude tests are used to determine an individual's ability/potential to succeed in a certain task, with no prior knowledge or training and are frequently used as part of a pre-employment assessment. Aptitude tests are a proven tool used to identify those who are best equipped to carry out any given role.*

*A **logical reasoning test** is a form of testing that is widely used by corporate employers to help assesscandidates during their recruitment process.*

**UNIT 1 UNITARY METHODS** **6**

Number System, Time and Work, Pipes and Cisterns

**UNIT 2 NUMERICAL COMPUTATION** **6**

Ratio and Proportion, Problems on Age

**UNIT 3 NUMERICAL ESTIMATION I** **6**

Time and Distance, Problems on Trains, Boats and Streams

**UNIT 4 NUMERICAL ESTIMATION II** **6**

Percentage, Profit and Loss, Simple Interest and Compound Interest

**UNIT 5 LOGICAL REASONING** **6**

Direction Sense, Seating Arrangements, Coding and Decoding

**TOTAL: 30 PERIODS**

**REFERENCES:**


1. Dr.R.S.Aggarwal, "Quantitative Aptitude for Competitive Examination", S.Chand Publications,2022
2. Dr.R.S.Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S.Chand Publications, 2022


**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Solve the given equation using appropriate simplification methods and compute time, work, capacity and identify the pattern by analyzing the given problem/scenario |
| CO2 | Apply aptitude method of ratio and proportion to solve the given scenario. |
| CO3 | Calculate time, speed, distance by applying suitable aptitude method for the given problemstatement. |
| CO4 | Calculate percentage and profit & loss for the given problem statement and Compute simpleinterest, compound interest for the given problem/scenario. |
| CO5 | Use their logical thinking abilities to solve given problem involving direction sense, seatingarrangement and coding & decoding. |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 2 | 3 | - | 1 | - | - | - | - | - | - | - | 1 | - | - |
| CO 2 | 2 | 3 | - | 1 | - | - | - | - | - | - | - | 1 | - | - |
| CO 3 | 2 | 3 | - | 1 | - | - | - | - | - | - | - | 1 | - | - |
| CO 4 | 2 | 3 | - | 1 | - | - | - | - | - | - | - | 1 | - | - |
| CO 5 | 2 | 3 | - | 1 | - | - | - | - | - | - | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of English - VCET

Chairperson - BoS
Dept. of CSE - VCET

| 22MCL06 | **Communication Skills Laboratory**<br>(Fifth / Sixth Semester) | **L T P C**<br>**0 0 2 0** |
|---|---|---|

**Preamble :**

Communication Skill is a life skill necessary for all students of Engineering and Technology. The course Communicative Skills Laboratory aims at developing effective oral and written communication to facilitate their success in competitive examinations, and recruitment screening thereby ensuring professional success and progress.

**UNIT 1 RECEPTIVE SKILLS** **6**

**LISTENING & READING** – Developing Listening & Reading Skills - Comprehension and Analysis – Listening & Reading for Main Idea - Specific Information - Cloze Test- Rearranging words and sentences

**UNIT 2 PRODUCTIVE SKILLS** **8**

**SPEAKING & WRITING** - Group Discussion and Practice – Mock GD - Structure – Types - Techniques - Keywords -Vital qualities - Attitude and Opinion - Expository and Persuasive Paragraphs – Picture Description

**UNIT 3 ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS** **4**

Orientation to International English Language Testing System (IELTS) and other Competitive Examinations – MCQs

**UNIT 4 CAREER SKILLS** **6**

Types of Interviews - FAQ's - Mock Interviews - Body Language - Team Work - Managing Time - Managing Stress - Negotiation Skills - Networking – Profile Creation (Linked in, Portfolio)

**UNIT 5 VERBAL ABILITY** **6**

Synonyms and Antonyms - Idioms and Phrases - Sentence Construction and Improvement- Paraphrasing - Contextual Vocabulary - Verbal Analogy

**TOTAL: 30 PERIODS**

**REFERENCES:**


1. M Ashraf Rizvi "Effective Technical Communication", Tata McGraw-Hill, 2st Edition, New Delhi, 2018.
2. Koneru Aruna 'Professional Communication' MC Graw Hill Education, Chennai, 2008.
3. Upadhyay Meenakshi & Arun Sharma 'Comprehension Interpersonal & Communication Skills for General Studies Civil Services Preliminary Examination' MC Graw Hill Education, New Delhi, 2012.


**e. RESOURCES :**

1. https://www.teachingenglish.org.uk/article/email-writing
2. http://www.oxforddictionaries.com/words/writing-job-applications
3. https://www.fresherslive.com/online-test/verbal-ability-test/questions-and-answers
4. www.cambridgeenglish.org

Chairperson - BoS
Dept. of English - VCET

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

- **CO1** Respond quickly and correctly to questions from different types of scripts, exhibiting good comprehension and analyzing skills
- **CO2** Participate effectively in formal group discussions and prepare professional e mails, persuasive and expository paragraphs to establish and meet organizational needs and goals.
- **CO3** Fare well in IELTS and other English language assessment segments of competitive examinations within the stipulated time.
- **CO4** Write effective résumés, and face interviews with communicative competence and confidence, with a good knowledge of career skills .
- **CO5** Select appropriate vocabulary and idiomatic expressions, identify errors in syntax, and arrange sentences to make meaningful paragraphs, without any aid.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | - | - | - | - | 3 | - | - | - | - | 3 | - | - | - | - |
| CO 2 | - | - | - | - | - | - | - | - | 3 | 3 | - | - | - | - |
| CO 3 | - | - | - | - | - | - | - | - | - | 3 | - | 1 | - | - |
| CO 4 | - | - | - | - | - | - | - | - | 3 | 3 | - | 1 | - | - |
| CO 5 | - | - | - | - | - | - | - | - | - | 3 | - | 1 | - | - |
| Mapping Average | - | - | - | - | 3 | - | - | - | 3 | 3 | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMC61 | EMBEDDED SYSTEMS AND INTERNET OF THINGS | L T P C<br>3 0 2 4 |
|---|---|---|

**Pre-requisites :**NIL

**Preamble :**

*The aim of this course is to learn the internal architecture and programming of an embedded processor and interfacing I/O devices to the processor and evolution of the Internet of Things (IoT). This course makes the students to build a small low-cost embedded and IoT system using Arduino/Raspberry Pi/ open platform. This course will enable the students to apply the concept of Internet of Things in real world scenario.*

**UNIT 1 8-BIT EMBEDDED PROCESSOR** **9**

8- Bit Microcontroller Architecture Instruction Set and Programming Programming Parallel Ports Timers andSerial Port Interrupt Handling.

**UNIT 2 EMBEDDED C PROGRAMMING** **9**

Memory And I/O Devices Interfacing Programming Embedded Systems in C Need For RTOS Multiple Tasks andProcesses Context Switching Priority Based Scheduling Policies.

**UNIT 3 IOT AND ARDUINO PROGRAMMING** **9**

Introduction to the Concept of IoT Devices IoT Devices Versus Computers IoT Configurations Basic Components Introduction to Arduino Types of Arduino Arduino Toolchain Arduino Programming Structure Sketches Pins Input/Output From Pins Using Sketches Introduction to Arduino Shields Integration of Sensors and Actuators withArduino.

**UNIT 4 IOT COMMUNICATION AND OPEN PLATFORMS** **9**

IoT Communication Models and APIs IoT Communication Protocols Bluetooth WiFi ZigBee GPS GSM modules Open Platform (like Raspberry Pi) Architecture Programming Interfacing Accessing GPIO Pins Sending and Receiving Signals Using GPIO Pins Connecting to the Cloud.

**UNIT 5 APPLICATIONS DEVELOPMENT** **9**

Complete Design of Embedded Systems Development of IoT Applications Home Automation Smart AgricultureSmart Cities Smart Healthcare.

**List of Experiments** **15**

1. Design an IOT based system.
2. Write Basic and arithmetic Programs Using Embedded C.
3. Perform ALU operations.
4. Introduction to Arduino platform and programming.
5. Introduction to Raspberry PI platform and python programming.
6. Communicate between Arduino and Raspberry PI using any wireless medium.
7. Explore different communication methods with IoT devices (Zigbee, GSM, Bluetooth).
8. Log Data using Raspberry PI and upload to the cloud platform.
9. Setup a cloud platform to log the data.

**Total : (L:45+P:15) 60 PERIODS**

**TEXT BOOKS:**


1. Muhammed Ali Mazidi,Janice Gillispie Mazidi,Rolin D.McKinlay,"The 8051 microcontroller and Embedded Systems",Pearson Education,Second Edition,2014.
2. Robert Barton ,Patrick Grossetete,David Hanes,Jerome henry,Gonzalo Salgueiro,"IoT Fundamentals:Networking Technologies,Protocols, and use cases for the Internet of Things",CISCOPress,2017.


Chairperson - BoS
Dept. of CSE - VCET

**REFERENCES:**


1. Michael J.Pont,"Embedded C",Pearson Education,2007
2. Wayne Wolf,"Computers as Components:Principles of Embedded Computer System Design",Elsevier,2006


**e. RESOURCES :**

1. https://nptel.ac.in/courses/128108016/, ACM India Summer School on IoT and Embedded Systems,IITMadras.
2. https://nptel.ac.in/courses/106103182/,"NOC:Embedded Systems- Design Verification and Test,Dr.SantoshBiswas,Prof.Jatindra Kumar Deka,Prof Arnab Sarkar-IIT Guwahati.

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Explain the architecture of embedded processors.
CO2 Write embedded C programs
CO3 Design simple embedded applications.
CO4 Compare the communication models in IOT.
CO5 Design IoT applications using Arduino/Raspberry Pi /open platform.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | | - | - | - | 1 | 2 | 3 | 3 | 2 | 1 |
| **CO2** | 2 | 1 | 3 | 2 | 2 | - | - | - | 1 | 2 | 2 | 3 | 3 | 1 |
| **CO3** | 3 | 1 | 3 | 3 | 1 | - | - | - | 1 | 2 | 1 | 1 | 2 | 2 |
| **CO4** | 3 | 2 | 3 | 2 | 1 | - | - | - | 1 | 2 | 2 | 3 | 2 | 2 |
| **CO5** | 2 | 3 | 3 | 2 | 2 | - | - | - | 1 | 3 | 3 | 3 | 3 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMT61 | NATURAL LANGUAGE PROCESSING | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites :**NIL

**Preamble :**

*Primary aim of the course is to introduce learners with essentials of natural language processing. The essentials cover linguistic aspects, core algorithms for solving basic tasks, statistical and shallow machine learning models for several natural language processing tasks.*

**UNIT 1 INTRODUCTION** **9**

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

**UNIT 2 WORD LEVEL ANALYSIS** **9**

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of- Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models..

**UNIT 3 SYNTACTIC ANALYSIS** **9**

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, DynamicProgramming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK,Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures..

**UNIT 4 SEMANTICS AND PRAGMATICS** **9**

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

**UNIT 5 DISCOURSE ANALYSIS AND LEXICAL RESOURCES** **9**

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC). Case Study : Overview of Large Language Models.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.


**REFERENCES:**


1. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, —Natural Language Processing with Javal, O'Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition,Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.


**e. RESOURCES :**

1. http://nptel.ac.in/
2. https://visiondummy.com

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Tag a given text with basic Language features |
| CO2 | Implement a rule based system to tackle morphology/syntax of a language |
| CO3 | Design a tag set to be used for statistical processing for real-time applications |
| CO4 | Compare and contrast the use of different statistical approaches for different types of NLP applications. |
| CO5 | Design innovative NLP applications by using tools to process natural language |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 3 |
| **CO2** | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 3 |
| **CO3** | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 3 |
| **CO4** | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 3 |
| **CO5** | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMT62 | BIG DATA ANALYTICS | L T P C<br>3 0 2 4 |
|---|---|---|

**Pre-requisites :** NIL

**Preamble :**

*This course will help to understand the knowledge on the Hadoop ecosystem components pig and Hive with its architecture. To familiarize the basics of MongoDB , Cassandra and JasperReports to create database*

**UNIT 1 INTRODUCTION TO BIG DATA** **9**

Types Of Digital Data-Characteristics of Data-Evolution of Big Data- Definition of Big Data Challenges of Big Data- Traditional Business Intelligence (BI) versus Big Data-A Typical Data Warehouse Environment-A Typical Hadoop Environment- Changing in the Realms of Big Data Coexistence of Big Data and Data Warehouse.

**UNIT 2 BIG DATA ANALYTICS** **9**

Definition of Big Data Analytics-Sudden Hype Around Big Data Analytics-Classification of Analytics-Greatest Challenges that Prevent Businesses from Capitalizing on Big Data-Top Challenges Facing Big Data- Importance of Big Data Analytics- Data Science-Data Scientist-Terminologies Used in Big Data Environment- Basically Available Soft State Eventual Consistency (BASE)- Top Analytics Tools. The Big Data Technology Landscape: NoSQL, Hadoop.

**UNIT 3 INTRODUCTION TO HADOOP** **9**

Introducing Hadoop: RDBMS versus Hadoop-Distributed Computing Challenges- History of Hadoop - Hadoop Overview –Hadoop Distributors- Hadoop Distributed File System- Processing Data with Hadoop-Managing Resources and Application with Hadoop YARN-Interacting with Hadoop Ecosystem

**UNIT 4 MONGODB** **9**

Introduction to MongoDB: Definition of MongoDB-Need of MongoDB- Terms used in RDBMS and MongoDB- Data Types in MongoDB- MongoDB Query Language

**UNIT 5 MAP REDUCE PROGRAMMING** **9**

Introduction to Mapreduce Programming: Mapper- Reducer-Combiner-Partitioner-Searching-SortingCompression. Case Study: Connecting to MongoDB NoSQL Database.

**LIST OF EXPERIMENTS** **15**

1. Instllation of single node/ Multi node cluster
2. Working with basic HDFS commands.
3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm
4. Perform CRUD (Create, Read, Update, and Delete)operations in MongoDB.
5. To practice import, export and aggregation in MongoDB.
   - Pick any public datasets from the site www.kdnuggets.com. Convert it into CSV format. Makesure at least two numeric columns
   - Compute the average of the values in the second numeric column

**TOTAL : (L:45+P:15) 60 PERIODS**

**TEXT BOOKS:**


1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", second Edition, Wiley, 2019.
2. Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman: Big data for dummies, First Edition,John Wiley & Sons Inc,2013.


Chairperson - BoS
Dept. of CSE - VCET

**REFERENCES:**


1. Tom White: Hadoop – The Definitive Guide,Third Edition,O"Reilly Media,2012.
2. Chuck Lam: Hadoop in action, First Edition,Manning Publications,2010.
3. Dirk Deroos, Paul C. Zikopoulos, Roman B. Melnyk, Bruce Brown: Hadoop for dummies, First Edition, John Wiley & Sons Inc, 2014.


**e. RESOURCES :**

1. http://nptel.ac.in/courses/110106064/Introduction to Data Analytics, Dr. Nandan Sudarsanam, IIT Madras.

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Describe the need for big data and different types of digital data.
CO2 Explain big data analytic techiques , various NoSQL systems and their features.
CO3 Analyze Hadoop ecosystem components, Hadoop Architecture and HDFS
CO4 Explain the concept for MongoDB.
CO5 Apply Map-Reduce based Big data applications.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 3 | 2 |
| CO2 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 3 | 2 |
| CO3 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 3 | 2 |
| CO4 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 3 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AML61 | NATURAL LANGUAGE PROCESSING LABORATORY | L T P C<br>0 0 2 1 |
|---|---|---|

**Preamble:**

*The main objective of natural language processing lab is to understand nlp concepts and perform syntactic andsemantic analysis.*

**LIST OF EXPERIMENTS**

1. Implement program to perform Word Analysis
2. Implement program to perform Word Generation
3. Implement program related to Morphology
4. Implement program related to N-Grams
5. Implement program related to N-Grams Smoothing
6. Build POS Tagging: Hidden Markov Model
7. Implement POS Tagging: Viterbi Decoding
8. Implement POS Tagger
9. Develop program to perform chunking
10. Develop program to build chunker

**SOFTWARE**

- Python

**TOTAL: 45 PERIODS**

**Course Outcomes: Upon completion of the course, students will be able to:**

| | |
|---|---|
| CO1 | Perform word level analysis using various NLP method. |
| CO2 | Perform Morphological analysis and N-grams smoothing . |
| CO3 | Perform POS tagging using Hidden Markov Model and Viterbi Decoding. |
| CO4 | Create POS taggers in NLP |
| CO5 | Analyze chunking operation and build chunker. |

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AML62 | MINI PROJECT | L T P C<br>0 0 6 3 |
|---|---|---|

**Preamble:**

*Python is a dynamic and powerful programming language that focuses on code readability. The Python language has diversified application in the software development companies such as in gaming, web frameworks and applications, language development, prototyping, graphic design applications, etc. This provides the language a higher plethora over other programming languages used in the industry.*

**TOTAL: 45 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Apply engineering fundamentals to analyze domain specific Issues to identify problem statement with objective and scope. |
| CO2 | Investigate the identified problem and review state of the art literature survey to synthesis system requirements |
| CO3 | Identify the risk/impact/technique and interpret the suitable standards related to the problem statement and design appropriate procedures/methods. |
| CO4 | Develop modules using discipline specific tools and implement the modules to achieve valid conclusion |
| CO5 | Prepare documents related to their findings for detailed presentation, Defend the findings and concludewith oral / written presentation |

Note:

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design and develop computer code. Demonstrate the novelty of the project through the results and outputs.

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMT71 | ECONOMICS AND MANAGEMENT FOR ENGINEERS | L T P C<br>3 0 0 3 |
|---|---|---|

**Preamble :**

*The main aim of this course is to understand the concepts of Economics with respect to the demand and supply analysis. This course makes the students to analyze the theory of production and the analysis of the cost parameter by using the Elasticity. This course will enable the students to manage and plan the situation with the help of the available strategies to support the decision making process.*

**UNIT 1 INTRODUCTION TO ECONOMICS** **9**

Introduction to Economics – Scope of Economics – Positive and Normative Science – Methodology of Economics– Economic Laws - Economy and its basic problems: Economy and its working – Kinds of economy systems – Basic problems of economy.

**UNIT 2 DEMAND AND SUPPLY ANALYSIS** **9**

The Law of Demand – The Law of Supply – Elasticities of Demand and Supply: Price Elasticity of Demand - Price Elasticity and Consumption Expenditure- Cross Elasticity of Demand – Income Elasticity of Demand – The Elasticity of Price Expectations – The uses of Elasticity– Price Elasticity of Supply.

**UNIT 3 THEORY OF PRODUCTION AND ANALYSIS OF COST** **9**

Meaning of Production – Production concepts – Production Function – Laws of Production – Cost Concepts -Short-Run Cost Output Relations – Long Run Cost output relations – Economics of Scale.

**UNIT 4 INTRODUCTION TO MANAGEMENT** **9**

Management: An Overview – Management Defined – Managerial skills – Managerial roles – Management responsibilities – Management functions. Evolution of Management: Classical approaches to Management– Contemporary Management Perspectives.

**UNIT 5 PLANNING** **9**

Planning and Forecasting: Importance of Planning – Principles of effective Planning – Planning process –Types ofPlans. Strategic Planning: Strategic Planning process – Rational decision making.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. D.N.Dwivedi, "Principles of Economics", Second Edition, Vikas Publishing House (P) Limited, NewDelhi,2012.
2. J.S.Chandan, "Management Concepts and Strategies", Vikas Publishing House (P) Limited, NewDelhi,2003.

**REFERENCES:**

1. Ranbir Singh," Principles of Engineering Economics and Management", S .K.Kataria& Sons, NewDelhi,2013.
2. Manish Varshney and VidhanBanerjee,"Engineeringand Managerial Economics",First Edition, CBSPublishersand Distributors Pvt. Ltd., 2015.\

**e. RESOURCES :**

1. http://nptel.ac.in/courses/110101005/, Prof.Trupti Mishra, S.J.M. School of Management, IITMumbai, Managerial Economics.
2. https://nptel.ac.in/courses/122106031/slides/3_1s.pdf, Dr.M.Thenmozhi, Professor, IIT Madras.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Summarize how to solve economics principles to solve economic problems in engineering discipline bysatisfying the economic laws. |
| CO2 | Discuss the demand and supply process for a market analysis using Price elasticity, Cross elasticity andIncome elasticity. |
| CO3 | Interpret short run and long run costs in the process of production for carrying out a business. |
| CO4 | Apply managerial skills to make decisions and solve problems for achieving organizational objectives. |
| CO5 | Express the principles of effective planning for survival and success of all organizations using standing andsingle use planning methods. |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 1 | 3 | - | 2 | - | 2 | 1 | - | - | - | 2 | 1 | - | - |
| **CO 2** | 1 | 3 | - | 2 | - | 2 | 1 | - | - | - | 2 | 1 | - | - |
| **CO 3** | 1 | 3 | - | 2 | - | 2 | 1 | - | - | - | 2 | 1 | - | - |
| **CO 4** | 1 | 3 | - | 1 | - | 2 | 1 | - | - | - | 2 | 1 | - | - |
| **CO 5** | 1 | 3 | - | 1 | - | 2 | 1 | 2 | - | - | 2 | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMT72 | CRYPTOGRAPHY AND CYBER SECURITY | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites** :NIL

**Preamble :**

*This course is designed to span a wide variety of topics in cryptosystems and helps to understand cyber crimesand cyber security*

**UNIT 1 INTRODUCTION TO SECURITY** **9**

Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services and Mechanisms – A Model for Network Security – Classical encryption techniques: Substitution techniques, Transposition techniques, Steganography – Foundations of modern cryptography: Perfect security – Information Theory – Product Cryptosystem – Cryptanalysis.

**UNIT 2 SYMMETRIC CIPHERS** **9**

Number theory – Algebraic Structures – Modular Arithmetic - Euclid's algorithm – Congruence and matrices – Group, Rings, Fields, Finite Fields SYMMETRIC KEY CIPHERS: SDES – Block Ciphers – DES, Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Pseudorandom Number Generators – RC4 – Key distribution.

**UNIT 3 ASYMMETRIC CRYPTOGRAPHY** **9**

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem – Chinese Remainder Theorem – Exponentiation and logarithm ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange — Elliptic curve arithmetic – Elliptic curve cryptography.

**UNIT 4 INTEGRITY AND AUTHENTICATION ALGORITHMS** **9**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function: HMAC, CMAC – SHA – Digital signature and authentication protocols –SHA-3 – DSS – Schnorr Digital Signature Scheme – ElGamal cryptosystem – Entity Authentication: Biometrics, Passwords, Challenge Response protocols – Authentication applications – Kerberos
MUTUAL TRUST: Key management and distribution – Symmetric key distribution using symmetric and asymmetric encryption – Distribution of public keys – X.509 Certificates

**UNIT 5 CYBER CRIMES AND CYBER SECURITY** **9**

Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods – Password Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. William Stallings, "Cryptography and Network Security - Principles and Practice", 8th Edition, Pearson Education, 2023.
2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber crimes, ComputerForensics and Legal Perspectives", First Edition, Wiley India, 2011.


**REFERENCES:**


1. Behrouz A. Ferouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata Mc Graw Hill, 2015.
2. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.


**e. RESOURCES :**

1. https://onlinecourses.nptel.ac.in/noc22_cs90/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs127/preview

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Understand the fundamentals of networks security, security architecture, threats and Vulnerabilities |
| CO2 | Apply the different cryptographic operations of symmetric cryptographic algorithms |
| CO3 | Apply the different cryptographic operations of public key cryptography |
| CO4 | Apply the various Authentication schemes to simulate different applications |
| CO5 | Understand various cyber crimes and cyber security |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 1 | - | - | - | 1 | - | - | 1 | 1 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 1 | - | - | - | 2 | - | - | 1 | 1 | 3 |
| CO3 | 3 | 3 | 2 | 2 | 1 | - | - | - | 2 | - | - | 1 | 1 | 3 |
| CO4 | 3 | 3 | 2 | 2 | 1 | - | - | - | 2 | - | - | 1 | 1 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 1 | - | - | - | 3 | - | - | 1 | 1 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

| 22HST71 | HUMAN VALUES AND PROFESSIONAL ETHICS | L T P C<br>1 0 0 1 |
|---|---|---|

**Pre-requisites :**NIL

**Preamble :**

*Universal Human Values is a life skill necessary for all students of Engineering and Technology. The course aims to identify the values and skills, and to realize the need, basic guidelines, content and process of value education. Professional Ethics For Engineers deals with the human values, integrity and work ethics in the common world. This course is mainly concerned about the theories of ethics, which form the basis for the understanding and responsibility of the various groups encountered in Engineering.*

**UNIT 1 INTRODUCTION TO UNIVERSAL HUMAN VALUES** 9

Understanding the need, basic guidelines, content and process for Value Education. Self Exploration–Mechanism for self exploration. Continuous Happiness and Prosperity- Basic Human Aspirations and its requirements for fulfillment of Human Aspirations understanding and living in harmony at various levels

**UNIT 2 HARMONY IN ONESELF, FAMILY AND SOCIETY** 9

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationships. Trust and Respect- values of relationship. Difference between intention and competence. Difference between respect and differentiation

**UNIT 3 HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS** 9

Natral acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics. Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models.

**UNIT 4 ENGINEERING ETHICS** 9

Senses of Engineering Ethics– Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy – Kohlberg's theory – Gilligan's theory – Consensus and controversy – Models of professional roles –Professional responsibility - Moral reasoning - Theories about right action – Self interest – Self respect – Duty ethics – Customs and religion.

**UNIT 5 ENGINEERING AS SOCIAL EXPERIMENTATION** 9

Engineering as experimentation – Engineers as responsible experimenters – Role of codes- Codes of Ethics– Sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of Electronics and Telecommunication Engineers (IETE) – A balanced outlook on law - Safe exits -The Bhopal gas tragedy and Challenger case study.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Gaur R R, Sangal R, Bagaria G P, "A Foundation Course in Human Values and Professional Ethics".2009
2. Govindarajan M, Natarajan S and Senthil Kumar V. S, "Engineering Ethics", PHI Learning Pvt. Ltd,New Delhi, 2017.

**REFERENCES:**


1. Bancrjee B P, "Foundations of Ethics and Management", Excel Books. 2005.
2. Bajpai B L, "Indian Ethos and Modern Management", New Royal Book Co., Lucknow. Reprinted 2008.
3. Subramanian R, "Professional Ethics", Oxford university press, 2017.


**e. RESOURCES :**

1. https://www.uhv.org.in/
2. https://nptel.ac.in/courses/109/106/109106117/

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Relate the significance of value inputs in a classroom and start applying them in their life and profession. |
| CO2 | Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and theBody, Intention and Competence of an individual |
| CO3 | Interpret the value of harmonious relationships based on the trust and respect in their life and profession |
| CO4 | Discuss the ethical issues related to Engineering. |
| CO5 | Discuss Engineer's work in the context of its impact on society. |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | - | - | - | - | - | 2 | 3 | 2 | 2 | - | - | 2 | - | - |
| **CO 2** | - | - | - | - | - | 3 | - | 3 | 1 | - | - | 2 | - | - |
| **CO 3** | - | - | - | - | - | 2 | 2 | 3 | 3 | 3 | - | 2 | - | - |
| **CO 4** | 1 | 2 | - | - | - | 3 | - | 2 | - | - | - | 2 | - | - |
| **CO 5** | 2 | 2 | 1 | - | - | 3 | 2 | 2 | - | - | - | 2 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AML71 | SECURITY LABORATORY | L T P C<br>0 0 2 1 |
|---|---|---|

**Preamble:**

*This laboratory course is intended to expose the students to different cipher techniques and to implement algorithms like DES, RSA, MD5, SHA-1 and Defeating Malware using Java programming language/Python programming language*

**LIST OF EXPERIMENTS**

1. Implement the following Substitution & Transposition Techniques
   a) Caesar Cipher
   b) Playfair Cipher
   c) Hill Cipher
2. Implement the following algorithms
   a) DES
   b) RSA Algorithm
   c) Diffiee-Hellman
   d) MD5
   e) SHA-1
3. Implement the Signature Scheme - Digital Signature Standard
4. Demonstrate how to provide secure data storage, secure data transmission and forcreating digitalsignatures (GnuPG).
5. Setup a honey pot and monitor the honeypot on network (KF Sensor)
6. Installation of rootkits and study about the variety of options
7. Perform wireless audit on an access point or a router and decrypt WEP and WPA.( Net Stumbler)
8. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)
9. Defeating Malware i) Building Trojans ii) Rootkit Hunter

**TOTAL: 45 PERIODS**

**Course Outcomes: Upon completion of the course, students will be able to:**

| | |
|---|---|
| CO1 | Implement and test symmetric and asymmetric cipher techniques using Java/Python. |
| CO2 | Implement digital signature standard and verify the authentication process using Java/Python. |
| CO3 | Implement and test digital signature standard using GnuPG |
| CO4 | Implement and test honey pot using KF Sensor. |
| CO5 | Implement and test IDS and WEP, WPA using snort and Net stumbler respectively |

Chairperson - BoS
Dept. of CSE - VCET

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

| 22MCT07 | INDIAN CONSTITUTION AND TRADITIONAL KNOWLEDGE | L T P C<br>2 0 0 0 |
|---|---|---|

**Preamble :**

*The course provides basic information on Indian Constitution and Indian Traditional knowledge. This is essential for all citizens and especially for engineers so that they become aware of Indian polity and governance. This also reminds the citizen about their obligation, adherence and up keeping of Constitutional rights*

**UNIT 1** **6**

'Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy - Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha

**UNIT 2** **6**

Governor: Role and Position, CM and Council of ministers, State Secretariat: organisation, Structure and Functions District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,

**UNIT 3** **6**

Panchayatraj: Introduction, PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Position and role, Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

**UNIT 4** **6**

Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

**UNIT 5** **6**

Basics structure of Indian Knowledge System-Modern Science and Indian Knowledge -Philosophical Tradition - Indian Linguistic Tradition (Phonology, morphology, syntax and semantics) – Indian Artistic Tradition

**TOTAL: 30 PERIODS**

**TEXT BOOKS:**


1. M.Rajaram, Indian Constitution, New Age International, 2009.
2. V.Sivaramakrishnan(Ed.) Cultural Heritage of India (Course Material),Bharatiya Vidya Bhavan, Mumbai, 5thEdition,2014.


**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Describe the emergence and evolution of Indian Constitution, structure and composition of Indian Constitution and federalism in the Indian context.

CO2 List the functions of Centre, States and District Administrations, Fundamental rights needed to develop human personality in free society.

CO3 Identify different levels of Panchayat Raj system and its working.

CO4 Elaborate the role of Election Commission and its power to conduct free and fair election throughout India.

CO5 Develop a broad understanding of Indian society and intercultural literacy through cultural immersion.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | 3 | 2 | 2 | 2 | 2 | - | 2 | - | - |
| CO2 | - | - | - | - | - | 3 | 2 | 2 | 2 | 2 | - | 2 | - | - |
| CO3 | - | - | - | - | - | 3 | 2 | 2 | 2 | 2 | - | 2 | - | - |
| CO4 | - | - | - | - | - | 3 | 2 | 2 | 2 | 2 | - | 2 | - | - |
| CO5 | - | - | - | - | - | 3 | 2 | 2 | 2 | 2 | - | 2 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

| 22AML81 | INTERNSHIP | L T P C<br>0 0 0 2 |
|---|---|---|

**Pre-requisites:** Knowledge of Computer Science and Engineering

**Preamble :**

*Internships are educational and career development opportunities, providing practical experience in a field or discipline. Internships are far more important, as employers arelooking for employees who are properly skilled and have awareness about the industry environment, practices, and culture. The internship is structured, short-term, supervised training often focused on particular tasks or projects with defined time scales.*

**GUIDELINE FOR REVIEW AND EVALUATION**

Students have to undergo four-week practical training in Computer Science and Engineering related organizations of their choice but with the prior approval from the institution. At the end of the training student will submit a report as per the prescribed format to the department. The student shall make a power point presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made.

**Evaluation of Project Report and Viva voce examination: 100 marks**

(The student will be evaluated based on the report and the viva voce examination by an internal examiner)

**TOTAL: 30 PERIODS**

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| CO1 | Apply the acquired knowledge in the design of components and systems to solve the real-life problems. |
| CO2 | Solve the given problems by applying the concepts of living and nonliving systems. |
| CO3 | Apply the Computer Science and Engineering concepts to solve the engineering problems. |

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

| 22AML82 | PROJECT WORK | L T P C<br>0 0 20 10 |
|---|---|---|

**Preamble:**

*This course develops the ability to solve a specific problems in-depth insight into the concepts, principles, formulation of the projects and network technique right from its identification and literature review till the successful solution of the same. It also trains the students in preparing project reports and to face reviews and viva voce examination.*

**TOTAL: 180 PERIODS**

Note:

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

Chairperson - BoS
Dept. of CSE - VCET

# PROFESSIONAL ELECTIVES

Chairperson - BoS
Dept. of CSE - VCET

| 22AME11 | EXPLORATORY DATA ANALYSIS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Python Programming

**Preamble**

*The main aim of this course to outline an overview of exploratory data analysis. To implement data visualization using Matplotlib.To perform univariate data exploration and analysis.To apply bivariate data exploration and analysis.To use Data exploration and visualization techniques for multivariate and time series data.*

**UNIT 1 EXPLORATORY DATA ANALYSIS** **9**

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.

**UNIT 2 EDA USING PYTHON** **9**

Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations. Case study: Perform EDA on wine Quality Data set.

**UNIT 3 UNIVARIATE ANALYSIS** **9**

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality.

**UNIT 4 BIVARIATE ANALYSIS** **9**

Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.

**UNIT 5 MULTIVARIATE AND TIME SERIES ANALYSIS** **9**

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Timebased indexing – Visualizing – Grouping – Resampling. Case study: Perform Time Series Analysis and apply the various Visualization techniques.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017.
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008.


**REFERENCES:**


1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.


**e-RESOURCES:**

1. https://analyticsindiamag.com/

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Explain the concepts of exploratory data analysis and data transformation techniques for merging, reshaping and pivoting using software tools of EDA.

CO2 Implement the data manipulation, indexing and selection using Panda's Matplotlib for wine quality data set.

CO3 Perform univariate data exploration and analysis.

CO4 Apply bivariate data exploration and analysis.

CO5 Apply Data exploration and visualization techniques for multivariate and time series data using Pandas.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 2 | 3 | 1 | - | - | - | - | 2 | 2 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 2 | 3 | 1 | - | - | - | - | 2 | 2 | 3 | 2 |
| **CO3** | 3 | 3 | 3 | 2 | 3 | 1 | - | - | - | - | 2 | 2 | 2 | 2 |
| **CO4** | 3 | 3 | 3 | 2 | 3 | 1 | - | - | - | - | 2 | 2 | 2 | 2 |
| **CO5** | 3 | 3 | 3 | 2 | 3 | 1 | - | - | - | - | 2 | 2 | 2 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME12 | TEXT AND SPEECH ANALYTICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Neural Networks and Deep Learning

**Preamble**

*Text analysis is a machine learning technique used to automatically extract valuable insights from unstructured text data. Companies use text analysis tools to quickly digest online data and documents, and transform them into actionable insights. Speech analysis is the process of analyzing voice recordings or live customer calls to contact centers with speech recognition software to find useful information and provide quality assurance.*

**UNIT 1 NATURAL LANGUAGE BASICS** **9**

Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stop-words – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model.

**UNIT 2 TEXT CLASSIFICATION** **9**

Vector Semantics and Embeddings -Word Embeddings - Word2Vec model – Glove model –FastText model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models. Case study: Use a transformer for implementing classification.

**UNIT 3 QUESTION ANSWERING AND DIALOGUE SYSTEMS** **9**

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems — evaluating dialogue systems. Case study: Design a chatbot with a simple dialog system.

**UNIT 4 TEXT-TO-SPEECH SYNTHESIS** **9**

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing - Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems. Case study: Convert text to speech and find accuracy.

**UNIT 5 AUTOMATIC SPEECH RECOGNITION** **9**

Speech recognition: Acoustic modelling – Feature Extraction - HMM, HMM-DNN systems. Case study: Design a speech recognition system and find the error rate.

**Total : 45 Periods**

**TEXT BOOKS:**

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Third Edition, 2022.
2. Dipanjan Sarkar, "Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data", APress,2018

**REFERENCES:**

1. Tanveer Siddiqui, Tiwary U S, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2. Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, "Fundamentals of Speech Recognition" 1st Edition, Pearson, 2009.

**e-RESOURCES:**

1. https://nptel.ac.in/courses/106101007,"Natural Language Processing", Prof. Pushpak Bhattacharyya, IIT Bombay.
2. https://nptel.ac.in/courses/106105158," Natural Language Processing",Prof. Pawan Goyal, IIT Kharagpur.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Explain existing and emerging deep learning architectures for text and speech processing
CO2 Classify the features of text documents using text classification algorithms
CO3 Develop question-answering systems, chatbots and dialogue systems for a given application.
CO4 Apply deep learning based text to speech systems to develop a speech synthesizer for a given application.
CO5 Develop a speech recognition system for a given application using deep learning models.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | - | 3 |
| **CO2** | 3 | 3 | 2 | 2 | 1 | 1 | 1 | - | - | - | 1 | 1 | - | 3 |
| **CO3** | 3 | 3 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | - | 3 |
| **CO4** | 3 | 3 | 2 | 2 | 1 | 1 | 1 | - | - | - | 1 | 1 | - | 3 |
| **CO5** | 3 | 3 | 2 | 2 | 1 | 1 | 1 | - | - | - | 1 | 1 | - | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

22AME13 **SOCIAL NETWORK ANALYSIS** **L T P C**
**3 0 0 3**

**Preamble:**

*The main aim of this course is to understand the concepts of Social Networks with respect to the information extracted from the social media. This course makes the students to analyze and mine thesocial network to predict the human behavior by representing the relationships between the users. This course will enable the students to visualize and represent the social network using the available representations.*

**UNIT 1 INTRODUCTION** **9**

Social Network Analysis: Definition and Features – The Development of Social Network Analysis – Basic Graph Theoretical Concepts of Social Network Analysis – Ties, Density, Path, Length, Distance, Betweenness, Centrality, Clique – Electronic Sources for Network Analysis – Electronic Discussion Networks, Blogs and Online Communities, Web-based Networks – Applications of Social Network Analysis.

**UNIT 2 SOCIAL NETWORK ANALYSIS** **9**

Introduction to Social Networks Profiles – Types of Commercial Social Network Profiles (CSNP) – Quantitative and Qualitative Analysis of CSNP – Analysis of Social Networks Extracted from Log Files – Data Mining Methods Related to SNA and Log Mining – Clustering Techniques – CaseStudy.

**UNIT 3 SEMANTIC TECHNOLOGY FOR SOCIAL NETWORK ANALYSIS** **9**

Introduction to Ontology based Knowledge Representation – Ontology Languages for the Semantic Web – RDF and OWL – Modeling Social Network Data – Network Data Representation, Ontological Representation of Social Individuals and Relationships – Aggregating and Reasoning with Social Network Data – Advanced Representations.

**UNIT 4 SOCIAL NETWORK MINING** **9**

Detecting and Discovering Communities in Social Network: Evaluating Communities – Methods for Community Detection – Applications of Community Mining Algorithms –Ethical Practices in Social Network Mining – Understanding and Predicting Human Behavior for Social Communities – Decentralized Online Social Networks – Multi-Relational Characterization of Dynamic Social Network Communities – Inferential Methods in Social Network Analysis.

**UNIT 5 VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS** **9**

Visualization of Social Networks Node-Edge Diagrams – Random Layout – Force-Directed Layout – Tree Layout – Matrix Representations –Matrix and Node-Link Diagrams – Hybrid Representations – Visualizing Online Social Networks – Applications – Covert Networks – Community Welfare – Collaboration Networks – Co-Citation Networks – Data Privacy in Social Networks.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Peter Mika, "Social Networks and the Semantic Web", Springer,2010.
2. Song Yang, Franziska B. Keller, Lu Zheng, "Social Network Analysis: Methods and Examples", Sage Publication,2016.
3. BorkoFurht, "Handbook of Social Network Technologies and Applications", Springer, 2010.


**REFERENCES:**


1. GuandongXu, Yanchun Zhang, Lin Li, "Web Mining and Social Networking Techniques and Applications", Springer,2011.
2. John Scott, Peter J. Carrington, "The SAGE Handbook of Social Network Analysis", Sage 2011.


**E-RESOURCES:**

1. https://nptel.ac.in/courses/106106169/, "Social Networks: The challenge", Prof. Sudharshan Iyengar,IIT –Ropar.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Discuss the principles behind the social network analysis using the network features.

CO2 Explain social network profiles and perform quantitative and qualitative analysis of commercial socialnetwork profiles using log files and log mining.

CO3 Apply the data mining techniques on socialnetworks analysis to extract the semantic relationship.

CO4 Utilize community mining algorithms to predict human behavior for social communities.

CO5 Examine random layout, force directed layout, tree layout and matrix representations for visualizationof social networks.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 1 | - | 1 | 1 | 1 | 1 | - | 1 | - | 1 | 1 | 1 |
| **CO2** | 2 | 3 | 1 | - | 1 | 1 | 1 | 1 | - | 1 | - | 1 | 1 | 2 |
| **CO3** | 2 | 3 | 1 | - | 1 | 1 | 1 | 1 | - | 1 | - | 1 | 1 | 2 |
| **CO4** | 2 | 3 | 1 | - | 1 | 1 | 1 | 1 | - | 1 | - | 1 | 1 | 2 |
| **CO5** | 2 | 3 | 1 | - | 1 | 1 | 1 | 1 | - | 1 | - | 1 | 1 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME14 | INFORMATION RETRIEVAL | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Preamble**

*Information Retrieval is part of data science/AI/Data Mining. It deals with retrieving information from data that is stored in systems. An IR system is software that provide access to books , journals and other documents, stores them and manages the document .Web search engines are the most visible IR applications.*

**UNIT 1 INTRODUCTION** **9**

Information Retrieval – Early Developments – The IR Problem – The Users' Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

**UNIT 2 MODELING AND RETRIEVAL EVALUATION** **9**

Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

**UNIT 3 TEXT CLASSIFICATION AND CLUSTERING** **9**

A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation metrics – Accuracy and Error – Organizing the classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-dimensional Indexing.

**UNIT 4 WEB RETRIEVAL AND WEB CRAWLING** **9**

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations -- Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

**UNIT 5 WEB SEARCH– LINK ANALYSIS AND SPECIALIZED SEARCH** **9**

Link Analysis –hubs and authorities – Page Rank and HITS algorithms - Hadoop & Map Reduce – Personalized search-Collaborative filtering and content-based recommendation of documents and products – handling "invisible" Web-Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval.

**TOTAL: 45 PERIODS**

Chairperson - BoS
Dept. of CSE - VCET

**TEXT BOOKS:**

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, —Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, —Recommender Systems Handbookǁ, First Edition, 2011

**REFERENCES:**

1. C. Manning, P. Raghavan, and H. Schütze, —Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

**e-RESOURCES:**

1. https://cse.iitkgp.ac.in/~pabitra/course/ir06/ir06.html.

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Explain the components and frameworks of IR and its role towards AI and web to fetch relevant information from web resources.

CO2 Apply suitable information retrieval models for a given web application to retrieve required information efficiently.

CO3 Apply document text mining techniques in information retrieval to categorize and clustering the information.

CO4 Analyzewebsearcharchitectureforagivenwebapplicationtocheckoptimizedsearchengine.

CO5 Use Link analysis , Hadoop and Map reduce to evaluate relevant scoring and ranking web search for quality results.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 1 | 1 | 1 | - | - | - | - | - | 1 | 2 | - | 2 |
| **CO2** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | 1 | 2 | - | 2 |
| **CO3** | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | 2 | - | 2 |
| **CO4** | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | 2 | - | 2 |
| **CO5** | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | 2 | - | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

22AME15 **DATA WAREHOUSING AND DATA MINING** L T P C 3 0 0 3

**Preamble:**

*The main aim of this course is to give basic knowledge about data warehouse and mining algorithms and also it develops research interest towards advances in data mining.*

**UNIT 1 DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP)** 9

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 2 DATA MINING – INTRODUCTION** 9

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

**UNIT 3 DATA MINING – FREQUENT PATTERN ANALYSIS** 9

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 4 CLASSIFICATION AND CLUSTERING** 9

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 5 WEKA TOOL** 9

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.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.


**REFERENCES:**


1. Sam Anahory, Dennis Murray, "Data Warehousing in the real world", A practical Guide for building
2. Paulraj Ponniah, "Data warehousing Fundamentals Comprehensive Guide for IT professionals, Wiley,
3. Andrew H. Johnston, "Practical Machine Learning: A Beginner's Guide to Data Mining with WEKA", July 2018.


**e-RESOURCES:**

1. http://nptel.ac.in/courses/106106093/35, "Data mining and Knowledge discovery, Data Mining, Mining for Association rules", Prof. Dr.S.Srinath, IIT-Madras.
2. http://nptel.ac.in/courses/106106093/31, "Introduction to Data warehousing and OLAP", Prof. Dr.S.Srinath, IIT-Madras.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Design a data warehouse and data mart that satisfies the information needs of management using givenschema for analysis.

CO2 Predict the interesting patterns for a given database, using data cleaning, data transformation, data normalization and data reduction.

CO3 Apply association algorithm to build analytical applications for a given database using Apriori, FP-treeassociation.

CO4 Analyze the given scenario using classification and K-means clustering to find the optimal classificationtree and cluster for an application.

CO5 Apply data mining algorithms for a given application using WEKA tool.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 3 | - | - | - | - | - | - | - | - | - | 1 | - |
| **CO2** | 2 | 3 | - | - | - | - | - | - | - | - | - | - | 1 | - |
| **CO3** | 2 | 3 | - | 2 | - | - | - | - | - | - | - | - | 1 | - |
| **CO4** | 2 | 3 | - | 2 | - | - | - | - | - | - | - | - | 1 | - |
| **CO5** | 2 | 3 | - | - | 2 | - | - | - | - | - | - | - | 1 | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME16 | BUSINESS INTELLIGENCE | L T P C<br>3 0 0 3 |
|---|---|---|

**Preamble**

*Business Intelligence systems provide historical, current, and predictive views of business operations, often using data that has been gathered into a data warehouse or a data mart and working from operationaldata.Softwareelementssupportreporting,interactiveslice-and-dice,pivot-tableanalyses, visualization, and statistical data mining.*

**UNIT 1 INTRODUCTION TO DIGITAL DATA** **9**

Introduction to digital data and its types–structured, semi-structured and unstructured, Introduction To OLTP and OLAP(MOLAP,ROLAP,HOLAP).

**UNIT 2 INTRODUCTION TO BUSINESS INTELLIGENCE** **9**

Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI,BI Framework, Role of Data Warehousing in BI,BI Infrastructure Components–BI Process, BI Technology, BI Roles & Responsibilities.

**UNIT 3 BASICS OF DATA INTEGRATION ( EXTRACTION TRANSFORMATION LOADING )** **9**

Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and applications.

**UNIT 4 INTRODUCTION TO MULTI-DIMENSIONAL DATA MODELING** **9**

Introduction to data and dimension modeling , multidimensional data model, ER Modeling vs. multi dimensionalmodeling,conceptsofdimensions,facts,cubes,attribute,hierarchies,starandsnowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS.

**UNIT 5 BASICS OF ENTERPRISE REPORTING** **9**

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS.

**TOTAL: 45 PERIODS**

**TEXTBOOKS:**


1. R.N Prasad and Seema Acharya," Fundamentals of Business Analytics", Second Edition, Wiley India PVT. Ltd., 2016.


**REFERENCES:**


1. LarissaT.Moss, S.Atre,"BusinessIntelligenceRoadmap:TheCompleteProjectLifecycle of Decision Making ", AddisonWesley,2003.
2. CarloVercellis,"BusinessIntelligence:DataMiningandOptimizationforDecisionMaking", WileyPublications, 2009.
3. David Loshin Morgan, Second Edition, 2012. Kaufman, "Business Intelligence: The Savvy Managers Guide",


**e-RESOURCES:**

1. https://nptel.ac.in/courses/110105089

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Summarize the concept of OLTP & OLAP using real time data.
CO2 Describe the essential components in the development of business intelligence system.
CO3 Describe the need and approaches of data integration.
CO4 Familiarize the concepts of multi-dimensional data modeling.
CO5 Design an enterprise dashboard that depicts the key performance indicators that helps in decision making.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | - | - | - | 1 | 1 | - | 2 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | - | - | - | 1 | 1 | - | 2 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | - | - | - | 1 | 1 | - | 2 |
| CO4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | - | - | - | 1 | 1 | - | 2 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | - | - | - | 1 | 1 | - | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME17 | IMAGE AND VIDEO ANALYTICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites:** Exploratory Data Analysis, Neural Networks and Deep Learning

**Preamble**

*The main aim of this course is to make understand the basics of image processing techniques for computer vision, to learn the techniques used for image pre-processing, to discuss the various object detection techniques and to understand the various Object recognition mechanisms.*

**UNIT 1 INTRODUCTION** **9**

Computer Vision – Image representation and image analysis tasks - Image representations – digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures- Case Study: T-pyramid of an image

**UNIT 2 IMAGE PRE-PROCESSING** **9**

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models – Edges in multi-speralct images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration – Case Study: Deriving the quad tree representation of an image using the homogeneity criterion of equal intensity

**UNIT 3 OBJECT DETECTION USING MACHINE LEARNING** **9**

Object detection– Object detection methods – Deep Learning framework for Object detection– bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-R-CNN-Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures-Case Study: Geometric transforms such as Rotation, Change of scale, Skewing, Affine transform calculated from three pairs of corresponding points and Bilinear transform calculated from four pairs of corresponding points.

**UNIT 4 FACE RECOGNITION AND GESTURE RECOGNITION** **9**

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition- Deep Face solution by Facebook - FaceNet for Face Recognition- Implementation using FaceNet- Gesture Recognition-Case Study: motion analysis using moving edges, and apply it to your image sequences and Facial Detection and Recognition.

**UNIT 5 VIDEO ANALYTICS** **9**

Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-RestNet and Inception v3 –Case Study: Event detection in video surveillance system

**Total : 45 Periods**

Chairperson - BoS
Dept. of CSE - VCET

**TEXT BOOKS:**

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", 4th edition, Thomson Learning, 2017.
2. Vaibhav Verdhan,(2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras,Apress 2021(UNIT-III,IV and V)

**REFERENCES:**

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited, 2011.
2. Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, "Video Analytics for Business Intelligence", Springer, 2012.
3. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach",2 nd Pearson Education, 2015 .
4. E. R. Davies, (2012), "Computer & Machine Vision", Fourth Edition, Academic Press.

**e-RESOURCES:**

1. https://onlinecourses.nptel.ac.in/noc21_cs93/preview
2. https://appsilon.com/object-detection-yolo-algorithm/

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Explain image processing techniques in computer vision and video analysis for the T-pyramid of an image .

CO2 Discuss pre-processing techniques for image smoothing, edge detection, line detection and restoration using the homogeneity criterion of equal intensity.

CO3 Perform geometric transformation on objects from three and four pairs of corresponding points using IoU, R-CNN and YOLO..

CO4 Explain the process involved in face recognition and gesture recognition and apply motion analysis for an image.

CO5 Elaborate on deep learning-based video analytics using ResNet and GoogleNet architectures for video surveillance systems .

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | 2 | - | 2 |
| CO2 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | 2 | - | 2 |
| CO3 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | 2 | - | 2 |
| CO4 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | 2 | - | 2 |
| CO5 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | 2 | - | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME18 | RECOMMENDER SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :-**

**Preamble**

*To understand the foundations of the recommender system, To learn the significance of machine learning and data mining algorithms for Recommender systems, To learn about collaborative filtering, To make students design and implement a recommender system. To learn collaborative filtering.*

**UNIT 1 INTRODUCTION** **9**

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD). Case Study : Data similarity measures using Python.

**UNIT 2 CONTENT-BASED RECOMMENDATION SYSTEMS** **9**

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

**UNIT 3 COLLABORATIVE FILTERING** **9**

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection. Case Study : collaborative filter techniques.

**UNIT 4 ATTACK-RESISTANT RECOMMENDER SYSTEMS** **9**

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms. Case Study : Attack for tampering with recommender systems.

**UNIT 5 EVALUATING RECOMMENDER SYSTEMS** **9**

Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures. Case Study : Accuracy metrics like Receiver Operated Characteristic curves.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed
3. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Sytems Handbook, 2nd ed, Springer 2015.
4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.


Chairperson - BoS
Dept. of CSE - VCET

**REFERENCES:**


1. M. Chiang, Networking Life, Cambridge, 2010. (Chapter 4).
2. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed


**e-RESOURCES:**

1. https://www.witpress.com/Secure/elibrary/papers/1845641523/1845641523005FU1.pdf
2. https://freevideolectures.com/course/4694/nptel-e-business/54

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Explain the concepts of recommender systems.
CO2 Demonstrate machine-learning and data-mining algorithms in recommender systems data sets.
CO3 Identify Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics
CO4 Summarize simple recommender system.
CO5 Organize about advanced topics of recommender systems.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | - | 3 |
| **CO2** | 3 | 3 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | - | 3 |
| **CO3** | 3 | 3 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | - | 2 |
| **CO4** | 3 | 3 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | - | 2 |
| **CO5** | 3 | 3 | 2 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | - | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME21 | CLOUD COMPUTING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Computer Networks

**Preamble:** Cloud computing involves delivering different types of services over the Internet. From software and analytics to secure and safe data storage and networking resources, everything can be delivered via the cloud. It became a hot issue for its advantages such as "reduce costs", "increase business flexibility" and/or "provide business continuity". Nowadays, all of the legacy systems are being moved to the cloud platform and its demand is increasing day by day. In future, all web or mobile applications will be available on the cloud.

**UNIT 1 UNDERSTANDING CLOUD COMPUTING** **9**

Origins and Influences–Basic Concepts and Terminology – Goals and Benefits–Risks and Challenges–Roles and Boundaries– Cloud Characteristics–Cloud Delivery Models: IaaS, PaaS, SaaS – Cloud Deployment Models: Public, Private, Community, Hybrid Clouds.

**UNIT 2 CLOUD ENABLING TECHNOLOGY** **9**

Data Center Technology – Virtualization Technology– Web Technology– Multitenant Technology– Service Technology– Case study : VM installation and deployment.

**UNIT 3 CLOUD COMPUTING MECHANISM** **9**

Cloud Infrastructure Mechanism: Cloud Storage, Cloud Usage Monitor, Resource Replication – Specialized Cloud Mechanism: Load Balancer, SLA Monitor, Pay-per-use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi Device Broker, State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System, Billing Management System.

**UNIT 4 CLOUD COMPUTING ARCHITECTURE** **9**

Fundamental Cloud Architectures: Workload Distribution Architecture– Resource Pooling Architecture– Dynamic Scalability Architecture– Elastic Resource Capacity Architecture– Service Load Balancing Architecture– Cloud Bursting Architecture – Elastic Disk Provisioning Architecture– Redundant Storage Architecture– Advanced Cloud Architectures: Hypervisor Clustering Architecture– Load Balanced Virtual Server Instances Architecture– Dynamic Failure Detection and Recovery Architecture – Case Study : AWS, Microsoft Azure.

**UNIT 5 BASIC SECURIOTY IN CLOUD** **9**

Basic Terms and Concepts – Threat Agents – Cloud Security Threats – Cloud Security Mechanism: Encryption, Hashing, Digital Signature, Public Key Infrastructure, Identity and Access Management, Single Sign-on, Cloud Based Security Groups, Hardened Virtual Server Images – Case study examples.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Thomas Erl, Zaigham Mahood, Ricardo Puttini, "Cloud Computing, Concept, Technology and Architecture", Prentice Hall, 2013.
2. K.Chandrasekaran, "Essentials of Cloud Computing", CRC Press, 2015.


Chairperson - BoS
Dept. of CSE - VCET

**REFERENCES:**


1. Kai Hwang, Geoffrey C Fox, Jack J.Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers,2012.
2. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computingl, Tata McGraw-Hill, 2013.


**e RESOURCES**

1. https://nptel.ac.in/courses/106/105/106105223/,"Google Cloud Computing Foundation Course", Prof. Soumya Kanti Ghosh, IIT Kharagpur.

**Course Outcomes:** Upon completion of this course, students will be able to:

| | |
|---|---|
| CO1 | Analyze and identify a specific cloud deployment model and delivery model to adopt for any given cloud application. |
| CO2 | Discuss the role of data center, virtualization, web, multitenant and service technologies in providing resilient, elastic and cost-efficient computing for a given cloud system. |
| CO3 | Assess and identify the required cloud computing mechanisms to deploy in cloud architectures when developing a given cloud application. |
| CO4 | Compare and evaluate the ability of cloud computing architectures to meet a set of requirements for a given business application. |
| CO5 | Choose suitable security mechanism to provide security for a given cloud application. |

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 1 | - | 1 | 1 | 1 | 1 | - | - | - | 1 | 1 | 3 |
| **CO2** | 3 | 3 | 1 | - | 1 | 1 | 1 | - | - | - | - | 1 | 1 | 3 |
| **CO3** | 3 | 3 | 1 | - | 1 | 1 | 1 | - | - | - | 2 | 1 | 1 | 3 |
| **CO4** | 3 | 3 | 1 | 1 | 1 | 1 | 1 | - | - | - | 2 | 1 | 1 | 3 |
| **CO5** | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | - | - | 2 | 1 | 1 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME22 | WEB PROGRAMMING | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites:-** Computer Networks

**Preamble**

*Web programming refers to the writing, mark-up and coding involved in Web development, which includes Web content, Web client and server scripting and network security. This course deals with most common web programming technologies such as HTML, CSS, Java Script, Angular JS and React JS for developing Web applications.*

**UNIT 1 Website Basics, HTML 5, CSS 3, WEB 2.0** 9

Web Essentials: Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Audio - CSS3 – Inline, embedded and external style sheets – Rule cascading – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions.

**UNIT 2 Java Script** 9

Introduction – Operators – Control Structures: Selection: if – if-else – switch. Repetition: while – do-while – for – break and continue. Functions: Function Definition – Scope Rules – Recursion. Array: Declaration – Initialization – Growing Arrays – Passing Arrays to Function. Event Handling.

**UNIT 3 Angular 6.0** 9

Introduction – Needs – Features – Evolution – Setup and Configuration – Components and Modules – Templates – Change Detection – Directives – Nested Components.– Data Binding – Pipe- Services – HTTP – Routing – Forms in Angular – Template Driven Forms – Reactive Forms – Custom Validators.

**UNIT 4 React JS** 9

ReactJS: Introduction –create React app - components – state – Tables – Forms-Hooks: useState– useEffect-Routing- props – state vs props – Class Components: constructor – Component API – Component Life cycle - Forms – controlled and uncontrolled component – Events – conditional rendering.

**UNIT 5 Server-side JS Framework** 9

Node JS: Introduction – Architecture – Features – Creating Web Servers with HTTP Request – Response – Event Handling – GET and POST Methods – Modules – Connect to NoSQL Database using Node JS – Implementation of CRUD operations.

**Total : 45 Periods**

**TEXT BOOKS:**

1. Paul Deitel, Harvey M.Deitel and Abbey Deitel, "Internet and World Wide Web – How To Program", 5th Edition, Prentice Hall, 2011 for Unit 1 & 2
2. Wieruch, Robin, "The Road to Learn React: Your Journey to Master Plain Yet Pragmatic React. Js." Germany, Lean Publishing, 2017 for Unit 3
   https://www.javatpoint.com, for Units 2 and 3

**REFERENCES:**

1. I and Deitel and Nieto, "Internet and World Wide Web - How to Program" , Prentice Hall, 5th Edition, 2011.
2. Uttam K.Roy, "Web Technologies", Oxford University Press, 2011.

**e - RESOURCES :**

1. https://nptel.ac.in/courses/106105084/11, "Internet Technology", Prof. I. Sengupta, IIT-Kanpur.
2. //nptel.ac.in/courses/106106156/3, "Introduction to Modern Application Development", Prof. Gaurav Raina, IIT-Madras.
3. //en.wikipedia.org/wiki/Web_development

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 n a static web page with appropriate user interface using I ITML and CSS.

CO2 ruct a static web page with necessary user interface and validation using Java Script objects by applying event handling mechanisms.

CO3 Develop a dynamic webpage with suitable user interface using Angular JS.

CO4 Apply the features of React JS to develop web applications.

CO5 Develop a web application using Node JS with database connectivity.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO 2** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO 3** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 3 | 2 |
| **CO 4** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 3 | 2 |
| **CO 5** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME23 | NOSQL DATABASE | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Basic Knowledge about DBMS , Database Architecture

**Preamble**

*This course introduces the Nosql Databases of database concepts to the students and gives practice to create and maintain a database. It also covers the concepts of logical and physical relationships in a data model and the concept of managing a database system. Students will use a computer aided software engineering tool to design, create, and query a database.*

**UNIT 1 INTRODUCTION TO NOSQL CONCEPTS** 9

Data base revolutions: First generation, second generation, third generation, Managing Transactions and Data Integrity, ACID and BASE for reliable database transactions, Speeding performance by strategic use of RAM, SSD, and disk, Achieving horizontal scalability with Data base sharding, Brewers CAP theorem.

**UNIT 2 NOSQL DATA ARCHITECTURE PATTERNS** 9

NoSQL Data model: Aggregate Models- Document Data Model- Key-Value Data Model-Columnar Data Model, Graph Based Data Model Graph Data Model, NoSQL system ways to handle big data problems, Moving Queries to data, not data to the query, hash rings to distribute the data on clusters, replication to scale reads, Database distributed queries to Data nodes.

**UNIT 3 KEY VALUE DATA STORES** 9

From array to key value databases, Essential features of key value Databases, Properties of keys, Characteristics of Values, Key-Value Database Data Modeling Terms, Key-Value Architecture and implementation Terms, Designing Structured Values, Limitations of Key-Value Databases, Design Patterns for Key-Value Databases, Case Study: Key-Value Databases for Mobile Application Configuration

**UNIT 4 DOCUMENT ORIENTED DATABASE** 9

Document, Collection, Naming, CRUD operation, querying, indexing, Replication, Sharding, Consistency Implementation: Distributed consistency, Eventual Consistency,Capped Collection, Case studies: document oriented database: Mongo DB and/or Cassandra.

**COLUMNAR DATA MODEL:** Data warehousing schemas: Comparison of columnar and row-oriented storage, Column-store Architectures: C-Store and Vector-Wise, Column-store internals and, Inserts/updates/deletes,Indexing, Adaptive Indexing and Database Cracking.

**UNIT 5 DATA MODELING WITH GRAPH** 9

Comparison of Relational and Graph Modeling, Property Graph Model Graph Analytics: Link analysis algorithm- Web as a graph, Page Rank- Markov chain, page rank computation, Topic specific page rank (Page Ranking Computation techniques: iterative processing, Random walk distribution Querying Graphs: Introduction to Cypher, case study: Building a Graph Database Application- community detection

**Total : 45 Periods**

**TEXT BOOKS:**


1. Guy Harrison, Next Generation Database: NoSQL and big data, Apress,2015.
2. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.


**REFERENCES:**


1. Christopher D.manning, Prabhakar Raghavan, Hinrich Schutze, An introduction to Information Retrieval, Cambridge University Press
2. Daniel Abadi, Peter Boncz and Stavros Harizopoulas, The Design and Implementation of Modern Column-Oriented Database Systems, Now Publishers.


Chairperson - BoS
Dept. of CSE - VCET

**e-RESOURCES:**

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

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Explain the detailed architecture, Database properties and storage requirements
CO2 Differentiate and identify right database models for real time applications
CO3 Outline Key value architecture and characteristics
CO4 Design Schema and implement CRUD operations, distributed data operations, implement various column store internals
CO5 Develop Application with Graph Data model

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 2 | - | - | - | 3 | - | 2 | 3 | 2 | 1 |
| CO2 | 3 | 2 | 2 | 2 | 3 | - | - | - | 2 | - | - | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 1 | 1 |
| CO4 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 2 | 2 |
| CO5 | 3 | 2 | 2 | 2 | - | 2 | - | - | - | - | 2 | 2 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME24 | SERVICE ORIENTED ARCHITECTURE | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites:** Software Engineering and Object-Oriented Analysis and Design.

**Preamble**

*This course enables the student to understand the XML fundamental concepts, its usage in data exchanges, XML related technologies, protocols and find out way to communicate with databases. This course makes the students to define "service" and "architecture" and establishes a strong understanding of the concepts needed to have an effective working knowledge of SOA methodologies, modeling, design, SOA technologies, orchestration and architectural frameworks.*

**UNIT 1 INTRODUCTION TO XML** **9**

XML document structure – Well formed and valid documents – Name spaces – DTD – XML Schema – X-Files-Case study: XML Vocabulary.

**UNIT 2 BUILDING XML- BASED APPLICATIONS** **9**

Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML-Case study: Raw AJAX.

**UNIT 3 SERVICE ORIENTED ARCHITECTURES** **9**

Characteristics of SOA, Comparing SOA with Client-Server, Distributed Internet architectures – Benefits of SOA – Anatomy of SOA - Principles of Service orientation.

**UNIT 4 WEB SERVICES** **9**

Service descriptions – WSDL – Messaging with SOAP – Service discovery – Message Exchange Patterns-Orchestration – Choreography – Service layers - WS Transactions – Web Services Enhancements.

**UNIT 5 BUILDING SOA-BASED APPLICATIONS** **9**

Service Oriented Analysis and Design – Service Modeling – WS-BPEL – WS-Coordination – WS-Policy-WS-Security – SOA support in J2EE.

**Total : 45 Periods**

**TEXT BOOKS:**

1. Guy Harrison, Next Generation Database: NoSQL and big data, Apress.
   Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence,
2. Wiley Publications,1st Edition ,2019.

**REFERENCES:**

1. Christopher D.manning, Prabhakar Raghavan, Hinrich Schutze, An introduction to Information Retrieval, Cambridge University Press 2015.
2. Daniel Abadi, Peter Boncz and Stavros Harizopoulas, The Design and Implementation of Modern Column-Oriented Database Systems, Now Publishers.

**e-RESOURCES:**

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

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to:

| | |
|---|---|
| CO1 | Create a valid and well-formed XML document for web based data entities using XML schema and DTD. |
| CO2 | Develop an XML application with a database using SAX and XSL Technologies. |
| CO3 | Compare the characteristics, benefits, service orientation principles of SOA with the components of Distributed system for a given application framework. |
| CO4 | Construct web service architecture using WSDL, SOAP and UDDI for business applications. |
| CO5 | Discuss the web service specification like WS-BPEL, WS-Coordination, WS-Policy, and WS-Security to build secure vs interaction SOA based applications. |

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 2 | 2 | - | - | - | 3 | - | 2 | 3 | 2 | 1 |
| **CO2** | 3 | 2 | 2 | 2 | 3 | - | - | - | 2 | - | - | 2 | 2 | 2 |
| **CO3** | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 1 | 1 |
| **CO4** | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 2 | 2 |
| **CO5** | 3 | 2 | 2 | 2 | - | 2 | - | - | - | - | 2 | 2 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME25 | UI/UX DESIGN | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Basics of website/app design and development

**Preamble**

*The course UI/UX Design introduces a sound knowledge in UI & UX to understand the need for UI and UX, the various Research Methods used in Design, explore the various Tools used in UI & UX and Creating a wireframe and prototype.*

**UNIT 1 FOUNDATIONS OF DESIGN** 9

UI vs. Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.

**UNIT 2 FOUNDATIONS OF UI DESIGN** 9

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides.

**UNIT 3 FOUNDATIONS OF UX DESIGN** 9

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals.

**UNIT 4 WIREFRAMING, PROTOTYPING AND TESTING** 9

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration.

**UNIT 5 RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE** 9

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Joel Marsh, "UX for Beginners", O'Reilly , 2022.
2. Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services" O'Reilly 2021.


**REFERENCES:**


1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface" 3 rd Edition , O'Reilly 2020
2. Steve Schoger, Adam Wathan "Refactoring UI", 2018


**e-RESOURCES:**

1. https://www.nngroup.com/articles/
2. https://www.interaction-design.org/literature

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Build user interfaces for user applications using divergent and convergent thinking.
CO2 Design user interface with necessary elements and patterns for user applications using UI style guides.
CO3 Evaluate UX design skills and design Process and its Methodology in product development.
CO4 Implement Sketching principles in responsive design for user interface.
CO5 Design user research methods of Personas, Solution Ideation, Scenarios using UI and UX.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 3 | 2 | 1 | - | 1 | - | - | - | 2 | 1 | 3 | 1 |
| **CO2** | 3 | 2 | 3 | 2 | 1 | - | 1 | - | - | - | 2 | 1 | 3 | 1 |
| **CO3** | 3 | 2 | 3 | 2 | 1 | - | 1 | - | - | - | 2 | 1 | 3 | 1 |
| **CO4** | 3 | 2 | 3 | 2 | 1 | - | 1 | - | - | - | 2 | 1 | 3 | 1 |
| **CO5** | 3 | 2 | 3 | 2 | 1 | - | 1 | - | - | - | 2 | 1 | 3 | 1 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

**22AME26** **DEVOPS** **L T P C**

**3 0 0 3**

**Pre-requisites :** Knowledge on Software Engineering concepts and Programming languages like Java, Python, Pearl, etc.

**Preamble**

*DevOps is the combination of cultural philosophies, practices, and tools that increase an organization's ability to deliver applications and services at high velocity: evolving and improving products at a faster pace than organizations using traditional software development and infrastructure management processes.*

**UNIT 1 INTRODUCTION TO DEVOPS** **9**

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

**UNIT 2 COMPILE AND BUILD USING MAVEN & GRADLE** **9**

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle

**UNIT 3 CONTINUOUS INTEGRATION USING JENKINS** **9**

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

**UNIT 4 CONFIGURATION MANAGEMENT USING ANSIBLE** **9**

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, AnsibleInventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible

**UNIT 5 BUILDING DEVOPS PIPELINES USING AZURE** **9**

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file

**Total : 45 Periods**

**TEXT BOOKS:**


1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016
2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014


**REFERENCES:**


1. Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni
2. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015


Chairperson - BoS
Dept. of CSE - VCET

**e-RESOURCES:**

1. https://www.jenkins.io/user-handbook.pdf
2. https://maven.apache.org/guides/getting-started/

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Understand different actions performed through Version control tools like Git.

CO2 Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins bybuilding and automating test cases using Maven & Gradle.

CO3 Ability to Perform Automated Continuous Deployment

CO4 Ability to do configuration management using Ansible

CO5 Understand to leverage Cloud-based DevOps tools using Azure DevOps

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 1 | 2 | 2 |
| **CO2** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 1 | 2 | 2 |
| **CO3** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 1 | 2 | 2 |
| **CO4** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 1 | 2 | 2 |
| **CO5** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 1 | 2 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME27 | SOFTWARE TESTING AND AUTOMATION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Software Engineering

**Preamble**

*This course enables the learner to understand the basics of software testing. Which addresses how to do the testing and planning .It teaches to build test cases and execute them. To focus on wide aspects of testing and understanding multiple facets of testing and also to get an insight about test automation and the tools used for test automation.*

**UNIT 1 FOUNDATIONS OF SOFTWARE TESTING** **9**

Why do we test Software?, Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V-model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing.

**UNIT 2 TEST PLANNING** **9**

The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.

**UNIT 3 TEST DESIGN AND EXECUTION** **9**

Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.

**UNIT 4 ADVANCED TESTING CONCEPTS** **9**

Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.

**UNIT 5 TEST AUTOMATION AND TOOLS** **9**

Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Yogesh Singh, "Software Testing", Cambridge University Press, 2012
2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" - Second Edition 2018.


**REFERENCES:**


1. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
2. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing
3. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth Edition, 2014, Taylor & Francis Group.
4. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.
5. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
6. Satya Avasarala, Selenium WebDriver Practical Guide, 2014, Packt Publishing.
7. Varun Menon, TestNg Beginner's Guide, 2013, Packt Publishing


Chairperson - BoS
Dept. of CSE - VCET

**e-RESOURCES:**

1. https://onlinecourses.nptel.ac.in/noc22_cs61/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs38/preview

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Understand the basic concepts of software testing and the need for software testing
CO2 Design Test planning and different activities involved in test planning
CO3 Design effective test cases that can uncover critical defects in the application
CO4 Carry out advanced types of testing
CO5 Automate the software testing using Selenium and Testing

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 1 | 2 | 1 | - | - | - | - | - | 2 | 1 | 1 | 2 |
| **CO2** | 3 | 3 | 1 | 2 | 1 | - | - | - | - | - | 2 | 1 | 1 | 2 |
| **CO3** | 3 | 3 | 1 | 2 | 1 | - | - | - | - | - | 2 | 1 | 1 | 2 |
| **CO4** | 3 | 3 | 1 | 2 | 1 | - | - | - | - | - | 2 | 1 | 1 | 2 |
| **CO5** | 3 | 3 | 1 | 2 | 1 | - | - | - | - | - | 2 | 1 | 1 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME28 | PROGRAMMING WITH JAVASCRIPT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Basic knowledge on HTML and Object Oriented Programming.

**Preamble**

*JavaScript is a loosely-typed client side scripting language that executes in the user's web browser. A web page without JavaScript is unimaginable today. There are many open source application development frameworks based on JavaScript.*

**UNIT 1 FRONT-END WEB DEVELOPMENT** **9**

Introduction to HTML - Introduction to CSS- Basics of JavaScript- Features of JavaScript-Advantages and Disadvantages of JavaScript - How does JavaScript works?-Structure of a JavaScript program- Adding JavaScript in HTML- Including External Javascript In Html – Front-end and back-end connectivitiy- Transfer data from back-end to front-end.

**UNIT 2 JAVASCRIPT CORE** **9**

JavaScript Data Types, Keywords, Comments and Variables - JavaScript Expressions and Operators - JavaScript Statements (Conditional and Looping), Functions and Objects- User Input and Output in JavaScript.

**UNIT 3 GETTING STARTED WITH JQUERY UI** **9**

jQuery – Basics - jQuery CSS Methods - Retrieving Page Content- Manipulating Page Content- Working with Events- Using the jQuery UI Plug-In, jQuery Animations and Effects.

**UNIT 4 NODE.JS** **9**

Node.jsBasics-Node.jsModules(Local,ExportModules)-NodePackageManager(NPM)-CreateWebServerinNode.js -Node.jsFile System-Data AccessinNode.js -Access MongoDBinNode.js-Node JS frameworks.

**UNIT 5 ANGULAR JS** **9**

Angular JS Basics - Angular Expressions and Data Binding- Angular MVC-Angular JS Modules and Forms - AngularJS Bootstrap Application. Responsive Web Design- Twitter Bootstrap - Making our application responsive. Python Backend Web Development with Django - User Registration and Login Authentication in Django –Steps in End to End Web Development – Steps in Host and manage the project live in any public hosting platform.

**Total : 45 Periods**

**TEXT BOOKS:**

1. JavaScript the Definitive Guide 7/ED Paperback – 15 June 2020.
2. Eloquent JavaScript 3E: A Modern Introduction to Programming Paperback – 4 December 2018.
3. JavaScript from Beginner to Professional: Learn JavaScript quickly by building fun, interactive, and dynamic web apps, games, and pages Paperback – Import, 22 January 2021.

**REFERENCES:**

1. https://www.lcg.ufrj.br/nodejs/books/react-beginners-handbook.pdf
2. https://pepa.holla.cz/wp-content/uploads/2015/10/Beginning-AngularJS.pdf

**e-RESOURCES:**

1. https://onlinecourses.swayam2.ac.in/aic20_sp11/preview, "Principles of Web Programming", by Prof Kannan Moudgalya, IIT Mumbai.
2. http://nptel.ac.in/courses/106105084/25
3. http://nptel.ac.in/courses/106105084/26
4. https://archive.nptel.ac.in/courses/106/106/106106156, " Introduction to modern application development", by Prof. Aamod Sane, Prof. Abhijat Vichare, Prof. Madhavan Mukund, IIT Chennai.

Chairperson BOS
Dept. of CSE - VCET

**Course Outcomes: At the end of this course, the students will be able to:**

| | |
|---|---|
| CO1 | Understanding the basics concepts of HTML, CSS and Java Script in HTML. |
| CO2 | JavaScript core: Identify expressions and operators. Summarize flow control. Demonstrate objects and arrays usage. Define functions and methods. |
| CO3 | Learn key jQuery concepts like callbacks and event handlers and understand the Document Object Model (DOM) and how JavaScript manipulates objects in the DOM. |
| CO4 | Understanding the concept of Node.JS and accessing database using MongoDB. |
| CO5 | Gaining knowledge on Angular JS, Responsive web design, and Python with Django. |

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | 1 | 3 | 3 |
| CO2 | 2 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | 1 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | 1 | 3 | 3 |
| CO4 | 2 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | 1 | 3 | 3 |
| CO5 | 2 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | 1 | 3 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME21 | CLOUD COMPUTING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Computer Networks

**Preamble:** Cloud computing involves delivering different types of services over the Internet. From software and analytics to secure and safe data storage and networking resources, everything can be delivered via the cloud. It became a hot issue for its advantages such as "reduce costs", "increase business flexibility" and/or "provide business continuity". Nowadays, all of the legacy systems are being moved to the cloud platform and its demand is increasing day by day. In future, all web or mobile applications will be available on the cloud.

**UNIT 1 UNDERSTANDING CLOUD COMPUTING** 9

Origins and Influences–Basic Concepts and Terminology – Goals and Benefits–Risks and Challenges– Roles and Boundaries– Cloud Characteristics–Cloud Delivery Models: IaaS, PaaS, SaaS – Cloud Deployment Models: Public, Private, Community, Hybrid Clouds.

**UNIT 2 CLOUD ENABLING TECHNOLOGY** 9

Data Center Technology – Virtualization Technology– Web Technology– Multitenant Technology– Service Technology– Case study : VM installation and deployment.

**UNIT 3 CLOUD COMPUTING MECHANISM** 9

Cloud Infrastructure Mechanism: Cloud Storage, Cloud Usage Monitor, Resource Replication – Specialized Cloud Mechanism: Load Balancer, SLA Monitor, Pay-per-use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi Device Broker, State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System, Billing Management System.

**UNIT 4 CLOUD COMPUTING ARCHITECTURE** 9

Fundamental Cloud Architectures: Workload Distribution Architecture– Resource Pooling Architecture– Dynamic Scalability Architecture– Elastic Resource Capacity Architecture– Service Load Balancing Architecture-- Cloud Bursting Architecture – Elastic Disk Provisioning Architecture– Redundant Storage Architecture– Advanced Cloud Architectures: Hypervisor Clustering Architecture– Load Balanced Virtual Server Instances Architecture– Dynamic Failure Detection and Recovery Architecture – Case Study : AWS, Microsoft Azure.

**UNIT 5 BASIC SECURIOTY IN CLOUD** 9

Basic Terms and Concepts – Threat Agents – Cloud Security Threats – Cloud Security Mechanism: Encryption, Hashing, Digital Signature, Public Key Infrastructure, Identity and Access Management, Single Sign-on, Cloud Based Security Groups, Hardened Virtual Server Images – Case study examples.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Thomas Erl, Zaigham Mahood, Ricardo Puttini, "Cloud Computing, Concept, Technology and Architecture", Prentice Hall, 2013.
2. K.Chandrasekaran, "Essentials of Cloud Computing", CRC Press, 2015.


Chairperson - BoS
Dept. of CSE - VCET

**REFERENCES:**


1. Kai Hwang, Geoffrey C Fox, Jack J.Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers,2012.
2. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computingl, Tata McGraw-Hill, 2013.


**e RESOURCES**

1. https://nptel.ac.in/courses/106/105/106105223/,"Google Cloud Computing Foundation Course", Prof. Soumya Kanti Ghosh, IIT Kharagpur.

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Analyze and identify a specific cloud deployment model and delivery model to adopt for any given cloud application.

CO2 Discuss the role of data center, virtualization, web, multitenant and service technologies in providing resilient, elastic and cost-efficient computing for a given cloud system.

CO3 Assess and identify the required cloud computing mechanisms to deploy in cloud architectures when developing a given cloud application.

CO4 Compare and evaluate the ability of cloud computing architectures to meet a set of requirements for a given business application.

CO5 Choose suitable security mechanism to provide security for a given cloud application.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 1 | - | 1 | 1 | 1 | 1 | - | - | - | 1 | 1 | 3 |
| **CO2** | 3 | 3 | 1 | - | 1 | 1 | 1 | - | - | - | - | 1 | 1 | 3 |
| **CO3** | 3 | 3 | 1 | - | 1 | 1 | 1 | - | - | - | 2 | 1 | 1 | 3 |
| **CO4** | 3 | 3 | 1 | 1 | 1 | 1 | 1 | - | - | - | 2 | 1 | 1 | 3 |
| **CO5** | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | - | - | 2 | 1 | 1 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME31 | DISTRIBUTED COMPUTING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Computer Networks

**Preamble:**

*A distributed system is a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another. The components interact withone another in order to achieve a common goal. An application of distributed systems includes multiplayer online games, web search, mobile and ubiquitous computing, finance and trading systems.*

**UNIT 1 INTRODUCTION** 9

Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web- System models-Physical model-Architectural model-Fundamental model.

**UNIT 2 COMMUNICATION IN DISTRIBUTED SYSTEM** 9

Inter process Communication - the API for internet protocols – External data representation and marshalling- Remote Invocation – Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI – Group communication - Publish-subscribe systems - Message queues - Shared memory approaches.

**UNIT 3 DISTRIBUTED FILE SYSTEM AND NAME SERVICES** 9

Distributed File Systems –Introduction – File service architecture – Andrew File system. **Case study:** Google File system. Naming - Introduction-Name services and domain name system-Directory Services-Peer to peer Systems-Napster-Peer to peer middleware- Routing overlays.

**UNIT 4 DISTRIBUTED TRANSACTIONS AND CONCURRENCY CONTROL** 9

Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks– Coordination and Agreement – Introduction - Distributed mutual exclusion algorithms – Election algorithms – Distributed Transactions– Flat and nested distributed transactions-Atomic Commit protocols – Concurrency control in Distributed systems- Distributed deadlocks-Transaction Recovery

**UNIT 5 PROCESS & RESOURCE MANAGEMENT** 9

**Process Management:** Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. **Resource Management:** Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

**Total : 45 Periods**

**TEXT BOOKS:**

1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.

**REFERENCES:**

1. Pradeep, "Distributed K Sinha Operating Systems: Concepts and Design", Prentice Hall of India,2012

Chairperson - Bo
Dept. of CSE - V

**e-RESOURCES:**

1. https://nptel.ac.in/courses/106106107/, "Inter process Communication", Prof. Ananthanarayana VS, Department of Information Technology, NITK ,Surathkal.
2. https://onlinecourses.nptel.ac.in/, "Time and global states", Dr. Rajiv Misra, Department of ComputerScience and Engineering, IIT, Patna.

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Discuss resource sharing principles, trends and challenges in a distributed system using World Wide Webas a case study.

CO2 Illustrate process communication using remote method invocation for a given distributed environment.

CO3 Describe the file systems for a distributed environment using distributed file service implementations.

CO4 Apply suitable concurrency control method to ensure multiple transactions to maintain ACID property and serializability in the schedules.

CO5 Explain process and resource management policies for a given distributed environment using Scheduling algorithms.

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | - | - | - | - | - | - | 1 | - | 1 | - | 2 |
| **CO2** | 3 | 3 | 2 | - | - | - | - | - | - | 1 | - | 1 | - | 2 |
| **CO3** | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 | - | 1 | - | 2 |
| **CO4** | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 | - | 1 | - | 2 |
| **CO5** | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 | - | 1 | - | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME32 | EDGE AND FOG COMPUTING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :**

**Preamble**

*It acquire knowledge on Edge Computing Architectures and Models and helps to understand Edge Computing technologies in which we can develop applications in Edge Computing and to acquire knowledge on the concepts of Fog Computing to understand optimization techniques data management in Fog Computing and to study the application development in Fog Computing*

**UNIT 1 EDGE COMPUTING ARCHITECTURES** **9**

An overview of edge computing Open challenges - Edge computing in a doudisation mode Standard reference architecture - Edge computing as a VNF - CloudPath-Cloud4Home-Femto Clouds-Scalable and Secure On loading of Edge ections Using AirBox

**UNIT 2 EDGE COMPUTING MODELS** **9**

Big data analytical models-Data security and privacy models- Networking models and protocols for edge computing - Computing and storage models for edge computing - Resource allocation models for edge computing

**UNIT 3 FOG COMPUTING FUNDAMENTALS** **9**

Concepts-Principles and related paradigms-Fog Computing in the loT environment-Fog Computing in the realm of Cloud Computing-Fog Computing in a developing world context

**UNIT 4 OPTIMIZATION PROBLEMS IN FOG COMPUTING** **9**

Case for optimization in Fog Computing Formal modelling framework for Fog Computing Optimization opportunities along the Fog archit and rvice life cycle-Towards a taxonomy of optimization problems in Fog Computing-Optimization techniques

**UNIT 5 APPLICATIONS OF FOG AND EDGE COMPUTING** **9**

Snart olies enabled by edge computing-Smart healthcare systems enabled by edge computing Smart hospitals enabled by edge computing Human Object Detection-Object Tracking-Lightweight Human Detection-Data-Driven Intelligent Transportation Systems

**Total : 45 Periods**

**TEXT BOOKS:**


1. Javid Taher Shuguang Deng. "Edge Computing: Models, lecnologies and applications" First Edson, The Institution of Engineering and Technology, 2020 2. Je Can Quen Zhang, Weisong Shi "Edge Computing: A Primer, First Edison, Springer national Publishing 2018.
2. Mahmood, Zargham (Ed)" Fog Computing-Concepts, Frameworks and Technologies. First Editon Springer, 2018.


**REFERENCES:**


1. At Singh Edge Computing: Simply in Depth", First Edition, Amazon Digital Services LLC, KDP Print 2019
2. Wu, Jie, Chang, Wei (Eds.), "Fog/Edge Computing for Security, Privacy, and Applications", First Edition, Springer International Publishing, 2020


Chairperson - BoS
Dept. of CSE - VCET

**e- RESOURCES**

1.https://www.e-education.psu.edu/geog583/node/55

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Describe the key architectures in edge computing to ensure all the components are active in the environment.

CO2 Examine the various edge computing models to brings enterprise applications closer to data sources.

CO3 Understand principles of Fog Computing and difference between Fog and cloud computing to access data faster and efficient ways.

CO4 Analyze the various optimization metrics in Fog computing to increase the performance of computation.

CO5 Designing and modeling the industrial applications for easy communication to maintain networks to store and manage data for improving scalability.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 2 | - | - | - | - | - | - | 1 | 2 | 2 |
| CO2 | 3 | 2 | 2 | 1 | 2 | - | - | - | - | - | - | 1 | 2 | 2 |
| CO3 | 3 | 2 | 2 | 1 | 2 | - | - | - | - | - | - | 1 | 2 | 2 |
| CO4 | 3 | 2 | 2 | 1 | 2 | - | - | - | - | - | - | 1 | 2 | 2 |
| CO5 | 3 | 2 | 2 | 1 | 2 | - | - | - | - | - | - | 1 | 2 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

22AME33 SECURITY AND PRIVACY IN CLOUD

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Pre-requisites : Computer Networks, Cloud Computing, Network Security**

**Preamble:** The course covers the fundamental Cloud Computing terminology, definition & concepts. It helps students to understand the security design and architectural considerations for Cloud. It also makes the students to get familiar with the Identity, Access control in Cloud. The best practices for Cloudsecurity using various design patterns are discussed. This also introducers learners to monitor and audit cloud applications for security.

**UNIT 1 FUNDAMENTALS OF CLOUD SECURITY CONCEPTS** **9**

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non-repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

**UNIT 2 SECURITY DESIGN AND ARCHITECTURE FOR CLOUD** **9**

Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key.

**UNIT 3 ACCESS CONTROL AND IDENTITY MANAGEMENT** **9**

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention.

**UNIT 4 CLOUD SECURITY DESIGN PATTERNS** **9**

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud. Case study Example

**UNIT 5 MONITORING, AUDITING AND MANAGEMENT** **9**

Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management. Case study Example

**Total : 45 Periods**

**TEXT BOOKS:**


1. Raj Kumar Buyya , James Broberg, Andrzej Goscinski, "Cloud Computing:Principles and Paradigms", Wiley 2013
2. Dave Shackleford, "Virtualization Security:Protecting Virtualized Environment (SYBEX)", Wiley 2012.


**REFERENCES:**


1. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy", ORIELLY 2009.
2. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, "Mastering Cloud Computing: Foundations and Applications Programming", Morgan Kaufmann, 2013.


Chairperson - BoS
Dept. of CSE - VCET

**e RESOURCES**

1. http://www.cloudbus.org/cloudsim/
2. https://www.youtube.com/watch?v=441BhZwa4ZM
3. https://www.youtube.com/watch?v=xccZmVGNS_Q

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Explain the fundamental security concepts for any given cloud application. ,
CO2 Discuss the strategies for a secure architecture and design of a given cloud application
CO3 Describe access control and identity management to apply for a given secure cloud application.
CO4 Explain the different design patterns to provide security for an given cloud application
CO5 Describe the different monitoring, auditing and management provisions of security to deploy for any given cloud application.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | - | 2 | 1 | 1 | - | - | - | 1 | 2 | 3 |
| **CO2** | 3 | 3 | 2 | 2 | - | 2 | 1 | 1 | - | - | - | 1 | 2 | 3 |
| **CO3** | 3 | 3 | 2 | 2 | - | 2 | 1 | 1 | - | - | - | 1 | 2 | 3 |
| **CO4** | 3 | 3 | 2 | 2 | - | 2 | 1 | 1 | - | - | - | 1 | 2 | 3 |
| **CO5** | 3 | 3 | 2 | 2 | - | 2 | 1 | 1 | - | - | - | 1 | 2 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME34 | DEVOPS AND SITE RELIABILITY ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites : Pre-requisites :** Knowledge on Software Engineering concepts and Programming languages like Java, Python, Pearl.

**Preamble**

*DevOps and SRE is the combination of cultural philosophies, practices, and tools that increase an organization's ability to deliver applications and services at high velocities is is done through automation and continuous integration and delivery and to improve the reliability of high-scale systems*

**UNIT 1 INTRODUCTION TO DEVOPS** 9

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

**UNIT 2 COMPILE AND BUILD USING MAVEN & GRADLE** 9

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle.

**UNIT 3 CONTINUOUS INTEGRATION USING JENKINS** 9

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

**UNIT 4 BASICS OF SITE RELIABILITY ENGINEERING** 9

Introduction,principle of SRE-SRE roles and responsibilities,SRE implementation

**UNIT 5 SRE PROCESSESS AND BEST PRACTICES** 9

Improving Enterprise Workflows-Monitoring System Performance-SRE &DEVOPS :Similarities And Difference Building SRE Sucess Culture At Linkedin.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016
2. Stephen Fleming, DevOps and Site Reliability Engineering (SRE) Handbook: Non-Programmer's Guide Paperback – Import, 23 November 2018


**REFERENCES:**


1. Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni
2. Site Reliability Engineering by Betsy Beyer, Chris Jones, Niall Richard Murphy, Jennifer Petoff Released April 2016.


**e-RESOURCES:**

1. https://www.jenkins.io/user-handbook.pdf.
2. https://www.linkedin.com/learning/site-reliability-engineering-service-level-agreements-and-objectives.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Understand different actions performed through Version control tools like Git to make comparisons in different code versions.

CO2 Perform Continuous Integration, Testing and Deployment using Jenkins by building and automating test cases using Maven & Gradle for Making Development and Operations Repeatable, Accessible, and Easier to Manage at Scale.

CO3 Ability to Perform Automated Continuous Deployment for changing the production environment automatically to the changes in the code.

CO4 Understanding Basics Concept of SRE to ensure their software applications remain reliable

CO5 Implementing SRE Process for a given real time application to perform operations to scale with load

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 2 | 2 |
| **CO2** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 2 | 2 |
| **CO3** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 2 | 2 |
| **CO4** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 2 | 2 |
| **CO5** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 2 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

22AME35 **POLY CLOUD** **L T P C**
**3 0 0 3**

**Prcamble :**

*A poly cloud approach focuses on the targeted use of multiple cloud platforms, exploiting specific strengths for the functional benefit of particular use cases.*

**UNIT 1 INTRODUCTION TO POLY CLOUD** **9**

Introduction to Polycloud - Types of Cloud Deployments - Paths to Polycloud- Polycloud: Cloud Specialization –Poly Cloud Architecture- Examples of service differentiated Polycloud architectures - Pros & Cons of Poly Cloud.

**UNIT 2 HYBRID CLOUD INFRASTRUCTURE** **9**

Understanding the Hybrid Cloud - Hybrid Cloud Challenges -Workload Migration-Integrating Between Clouds-Hybrid Cloud Architecture -Understanding the Components of the Hybrid Cloud- Choosing a Hybrid Cloud Solution-Examining Capabilities-Examining Decision-Making Criteria.

**UNIT 3 MULTI-CLOUD STRATEGY ENABLES DIGITAL TRANSFORMATION** **9**

How A Multi-Cloud Strategy Enables Digital Transformation - Defining Digital Transformation Digital Transformation in Practice -Using a Multi-Cloud Strategy to Achieve Digital Transformation.

**UNIT 4 HYBRID CLOUD SECURITY** **9**

Hybrid Cloud Security - Hybrid Cloud Security threats –Virtualization software security – Virtual machine security – Patch management – Intrusion detection and prevention – Identity access management – Developing secure Applications.

**UNIT 5 BUILDING YOUR CLOUD STRATEGY** **9**

The Process for moving to the cloud - Benefits – Infrastructure Options – Choosing Right Deployment options – Build Multi &hybrid cloud - Hybrid Cloud Platform – Cloud Migration.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. What is Cloud? Leveraging cloud differentiation in modern digital application,By Lee Atchison,O'Reilly May 2021.
2. Hybrid and Multicloud Solutions by Steve Suehring , O'Reilly Media, Inc,Apr 2019.


**REFERENCES:**


1. Greg Schulz, —Cloud and Virtual Data Storage Networking‖, Auerbach Publications [ISBN: 978-1439851739], 2012
2. Multi - Cloud Architecture and Governance: Leverage Azure, AWS, GCP, and VMware vSphere to build effective multi-cloud solutions,Jeroen Mulder,Dec 2020.


**e. RESOURCES :**

1. https://www.thoughtworks.com/insights/decoder/p/polycloud
2. https://www.packtpub.com/en-BE/product/hybrid-cloud-for-developers-9781788830874

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Understand the basics of poly cloud
CO2 Analyze the infrastructures for Cloud Environments.
CO3 Understand the optimization of cloud storage
CO4 Explain the hybrid cloud security with applications.
CO5 Describe the hybrid and multi cloud platforms.

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | 2 |
| CO 2 | 3 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | 2 |
| CO 3 | 3 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | 2 |
| CO 4 | 3 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | 2 |
| CO 5 | 3 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME36 | INFORMATION STORAGE MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Database Management Systems

**Preamble:** *Information Storage and Management (ISM) is the Knowledge gap in understanding varied components of information storage infrastructure in classic and virtual environments. It provides a comprehensive learning on storage technology, which will enable to make more informed decisions in an increasingly complex IT environment. It builds a strong understanding of underlying storage technologies and prepares you to learn advanced concepts, technologies and products. Storage networking technologies such as FC-SAN, IP-SAN, NAS, object-based and unified storage; business continuity solutions such as backup and replication.*

**UNIT 1 STORAGE TECHNOLOGY** **9**

Introduction to Information storage management-Challenges in data storage and data management-Solutions available for data storage-Core elements of data center infrastructure-Role of each element in supporting business activities.

**UNIT 2 STORAGE SYSTEMS ARCHITECTURE** **9**

Evolution of storage architecture-Key characteristics of data center-Physical and logical components of a connectivity environment -Major physical components of a disk drive and their function-logical constructs of a physical disk, access characteristics-and performance Implication- RAID implementation, RAID techniques-RAID levels,-impact of RAID on disk performance

**UNIT 3 INTRODUCTION TO NETWORKED STORAGE** **9**

Evolution of networked storage-Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN-Benefits of the different networked storage options-understand the appropriateness of the different networked storage options for different application environments

**UNIT 4 INFORMATION AVAILABILITY, MONITORING & MANAGING DATACENTERS** **9**

Business continuity (BC)- BC planning lifecycle-failure analysis and solution - Disaster recovery (DR) , architecture of backup/recovery and the different backup/ recovery topologies-replication technologies and their role in ensuring information availability and business continuity-Remote replication technologies and their role in providing disaster recovery and business continuity capabilities.-Identify key areas to monitor in a data center-Industry standards for data center monitoring and management-Key metrics to monitor for different components in a storage infrastructure- Key management tasks in a data center

**UNIT 5 SECURING STORAGE AND STORAGE VIRTUALIZATION** **9**

Information security-Risk traid, Storage security domains-Monitoring storage management-Storage infrastructure management activities-Storage infrastructure management challenges-Virtualization technologies-block-level and file-level virtualization technologies and processes

**Total : 45 Periods**

**TEXT BOOKS:**


1. EMC Corporation, "Information Storage and Management: Storing, Managing, and Protecting DigitalInformation", Wiley, India, 2012
2. Marc Farley, -Building Storage Networks‖, Tata McGraw Hill, Osborne, 2001.


Chairperson - BoS
Dept. of CSE - VCET

**REFERENCES:**


1. Robert Spalding, -Storage Networks: The Complete Reference—, Tata McGraw Hill , Osborne, 2003.
2. Meeta Gupta ,Storage Area Network Fundamentals, Pearson Education Limited,2002


**e - RESOURCES**

1. https://www.youtube.com/watch?v=A6rfvcF3zi4," Overview of Information Storage and Management"
2. https://www.youtube.com/watch?v=mZvmtZA2YH4," Information storage management"

**Course Outcomes:** Upon completion of this course, students will be able to:

| | |
|---|---|
| CO1 | Select from various storage technologies to suit for required application. |
| CO2 | Explain the concept of RAID and different RAID levels and their implementations and benefits. |
| CO3 | Describe the benefits of the different network storage options for different application environments. |
| CO4 | Discuss the different role in providing disaster recovery and business continuity capabilities. |
| CO5 | Use the storage security framework and practice storage monitoring and management activities. |

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 1 | 1 | - | 2 |
| **CO2** | 3 | 3 | 2 | - | - | - | - | - | - | - | 1 | 1 | - | 2 |
| **CO3** | 3 | 3 | 2 | - | - | - | - | - | - | - | 1 | 1 | - | 2 |
| **CO4** | 3 | 3 | 2 | 2 | - | 2 | 2 | - | - | - | 1 | 1 | 1 | 2 |
| **CO5** | 3 | 3 | 2 | 2 | - | 2 | 2 | 2 | - | - | 1 | 1 | 1 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME37 | VIRTUALIZATION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites : Computer Networks, Cloud Computing**

**Preamble:**

*Learn the basics and types of Virtualization and easy understand the Hypervisors and its types it help to Explore the Virtualization Solutions which can be Experiment the virtualization platforms.*

**UNIT 1 INTRODUCTION TO VIRTUALIZATION** **9**

Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization - partial virtualization - Paravirtualization-Types of Hypervisors

**UNIT 2 SERVER AND DESKTOP VIRTUALIZATION** **9**

Virtual machine basics- Types of virtual machines- Understanding Server Virtualization- types of server virtualization- Business Cases for Server Virtualization – Uses of Virtual Server Consolidation – Selecting Server Virtualization Platform-Desktop Virtualization-Types of Desktop Virtualization

**UNIT 3 NETWORK VIRTUALIZATION** **9**

Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization- VLAN-WAN Architecture-WAN Virtualization

**UNIT 4 STORAGE VIRTUALIZATION** **9**

Memory Virtualization-Types of Storage Virtualization-Block, File-Address space Remapping-Risks of Storage Virtualization-SAN-NAS-RAID

**UNIT 5 VIRTUALIZATION TOOLS** **9**

VMWare-Amazon AWS-Microsoft HyperV- Oracle VM Virtual Box - IBM PowerVM- Google Virtualization- Case study

**Total : 45 Periods**

**TEXT BOOKS:**


1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2017.
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2013 .
3. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach


**REFERENCES:**


1. Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", APress,2005
2. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.


**e-RESOURCES:**

1. https://www.mygreatlearning.com/blog/virtualization-in-cloud-computing/

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Discuss the virtualization concepts and Hypervisor to provide greater IT mobility

CO2 Apply the Virtualization for real-world applications to mask server resources from server users.

CO3 Install & Configure the different VM platforms to achieve major advances in speed, agility, and security

CO4 Experiment with the VM with various software helps to achieve location independence by abstracting the physical location of the data.

CO5 Create virtualization for real-world applications to increase the performance.

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | 3 |
| CO2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | 3 |
| CO3 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | 1 | 1 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | 2 | 1 | 1 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | 2 | 1 | 1 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME41 | AUGMENTED REALITY AND VIRTUAL REALITY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites : Computer Graphics & Multimedia**

**Preamble:** This course is designed to give historical and modern overviews and perspectives on augmented reality and virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of augmented reality and virtual reality systems.

**UNIT 1 IINTRODUCTION TO AUGMENTED REALITY(AR) 9**

History of AR - Augmented reality characteristics – Difference between Augmented Reality and Virtual Reality – AR technological components – Technologies used in AR – Feature Extraction – Hardware components – AR devices – Importance of AR - Real world uses of AR – AR types – Software tools available for AR.

**UNIT 2 TECHNOLOGIES NEEDED FOR AUGMENTED REALITY 9**

Hardware technology – virtual scenes – 3D objects – AR components – Display – HMD – Eyeglasses – Contact Lenses – significance of AR – AR powered devices – AR application development drawbacks – Compatibility – Performance – AR libraries – Motion tracking – Environmental understanding – Anchors.

**Case Study:** Study the design of an AR application with C# and Unity

**UNIT 3 INTRODUCTION TO VIRTUAL REALITY(VR) 9**

Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

**UNIT 4 VR MODELING 9**

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

**Case Study:** GHOST (General Haptics Open Software Toolkit) software development toolkit.

**UNIT 5 AUGMENTED REALITY AND VIRTUAL REALITY FOR MICROLEARNING 9**

Micro learning techniques – Utilizing VR for learning – VR for Practical online assessment – VR info graphics – Virtual case considerations - Utilizing AR for learning – Accessible learning – sensible data – elevated learner engagement - VR technology – Components of VR – VR Hardware – VR applications – Civil Engineering – Real Estate – Biology and Medicine – Virtual Mall – VR in Education – Virtual Laboratory – Factory Planning – Automobile Industry.

**Case Study:** Study of Microsoft Hololens.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Kaliraj, P., Devi, T. "Innovating with Augmented Reality: Applications in Education and Industry" (P. Kaliraj, Ed.) (1st ed.). CRC Press (2021). Taylor & Francis Group
2. Steven M. LaValle, "Virtual Reality", Cambridge University Press, 2023.
3. John Vince, "Introduction to Virtual Reality", Springer-Verlag, 2004


Chairperson - BoS
Dept. of CSE - VCET

**REFERENCES:**


1 Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, 2018

2 Schmalstieg / Hollerer,- "Augmented Reality: Principles & Practice" - Pearson Education India; First edition (12 October 2016),ISBN-10: 9332578494


**e-RESOURCES:**

1. https://www.vttresearch.com/sites/default/files/pdf/science/2012/S3.pdf
2. http://lavalle.pl/vr/book.html
3. https://www.coursera.org/learn/introduction-virtual-reality
4. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013311562184949760 5635_shared/overview

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Explain the types and choose appropriate tool for designing augmented reality based applications

CO2 Analyze the hardware requirement of AR and explain the use of computer vision concepts for designing AR.

CO3 Select an appropriate VR tool for a virtual reality based application.

CO4 Categorize and explain different models in VR modeling and choose appropriate modeling technique for a given problem.

CO5 Design and Explain a solution for a given scenario using AR-VR components and micro learning tools.

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High

Chairperson - BoS
Dept. of CSE - VCET

| 22AME42 | HUMAN COMPUTER INTERACTION | L T P C |
|---|---|---|
| | | 3 0 0 3 |

***Preamble:***
This course is designed to give fundamentals of Human Computer Interaction (HCI). and familiarize various types of existing interfaces, evaluation techniques and the applications of HCI in emerging trends.

**UNIT 1 FOUNDATIONS OF HUMAN-COMPUTER INTERACTION** **9**

Introduction - Good and poor design - Interaction design and its goals - Design and usabilityprinciples. Conceptualizing Interaction - Understanding the problem space – Conceptual models - Interface metaphors and paradigms - From conceptual models to physical design.Cognition - Introduction - What is cognition? - Conceptual frameworks for cognition.

**UNIT 2 BUILDING A SIMPLE GRAPHICAL USER INTERFACE** **9**

Collaboration and communication – Introduction - Social mechanisms - Ethnographic studies– frameworks. Interfaces – Introduction - What are affective aspects? - Expressive interfaces -
User frustration. Interaction design - Lifecycle models

**UNIT 3 HUMAN-CENTERED SOFTWARE DESIGN** **9**

Needs and establishing requirements - What are requirements? - Data gathering - Data interpretation - Task description and analysis. Design, prototyping and construction – Introduction - Conceptual design - Physical design. User-centered approaches - Ethnography in design - Participatory design.

**UNIT 4 HUMAN-CENTERED SOFTWARE EVALUATION** **9**

Evaluation - What, why, and when to evaluate,Case Study. An evaluation framework:Introduction-Evaluation paradigms and techniques-D E C I D E: A framework to guide evaluation. Observing users-Introduction - Goals, questions and paradigms - How to observe - Data collection - Indirect observation: Tracking users' activities - Analyzing, interpreting and presenting data.

**UNIT 5 HUMAN-CENTERED SOFTWARE TESTING** **9**

Asking users and experts: Introduction - Asking users: interviews, Questionnaires, Inspections, walkthroughs. Testing and modeling users – Introduction - User testing - Doing user testing – Experiments - Predictive models.

**TOTAL: 45 PERIODS**

**REFERENCES**


1. Yvonne Rogers, Helen Sharp, Jenny Preece, Interaction Design: beyond human-computer interaction,John-Wiley and Sons Inc., 2019.
2. Alan Dix , Janet Finlay, Gregory D.Abowd, Russell Beale, Human Computer Interaction, Pearson Education, 2008.
3. Jonathan Lazar Jinjuan, Heidi Feng, Harry Hochheiser, Research Methods in Human-Computer Interaction,
4. Wiley, 2010.
5. Dov Te'eni, Jane Carey, Ping Zhang, Human-Computer Interaction: Developing Effective Organizational Information Systems, John-Wiley and Sons Inc., 2007.
6. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009


**e-RESOURSES:**

1. http://www.tandfonline.com/loi/hihc20
2. http://www.guide2research.com/journals/human-computer-interaction
3. https://www.journals.elsevier.com/international-journal-of-human-computer-studies/

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes: Upon completion of this course, students will be able to**

CO1 Describe the requirements and specifications for the interaction design.
CO2 Describe the different types of interactions and interfaces.
CO3 Identify the techniques to support data analysis , interpretation and presentation
CO4 Analyze the evaluation techniques of human interaction
CO5 Determine the most appropriate HCI methods to test the needs of a practical software development project

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 3 |
| **CO2** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 3 |
| **CO3** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 3 |
| **CO4** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 3 |
| **CO5** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME43 | BRAIN COMPUTER INTERFACE | L T P C<br>3 0 0 3 |
|---|---|---|

***Preamble:***

*Brain-computer interfaces (BCIs) allow their users to communicate or control external devices using brain signals rather than the brain's normal output pathways of peripheral nerves and muscles. Efforts have recently begun to provide laboratory-validated BCI systems to severely disabled individuals for real-world applications. BCI review the BCI-relevant signals from the human brain, and describe the functional components of BCIs. We will also review current clinical applications of BCI technology, and identify potential users and potential applications. Finally, we will discuss current limitations of BCI technology, impediments to its widespread clinical use, and expectations for the future.*

**UNIT 1** INTRODUCTION TO BCI **9**

Introduction - Brain structure and function, Brain Computer Interface Types - Synchronous and Asynchronous -Invasive BCI -Partially Invasive BCI - Non Invasive BCI, Structure of BCI System, BCI Monitoring Hardware, EEG, ECoG, MEG, fMRI

**UNIT 2 BRAIN ACTIVATION** **9**

Brain activation patterns - Spikes, Oscillatory potential and ERD, slow cortical potentials, Movement related potentials-Mu rhythms, motor imagery, Stimulus related potentials - Visual Evoked Potentials – P300 and Auditory Evoked Potentials, Potentials related to cognitive tasks.

**UNIT 3 FEATURE EXTRACTION METHODS** **9**

Data Processing – Spike sorting, Frequency domain analysis, Wavelet analysis, Time domain analysis, Spatial filtering -Principal Component Analysis (PCA), Independent Component Analysis (ICA), Artifacts reduction, Feature Extraction - Phase synchronization and coherence.

**UNIT 4 MACHINE LEARNING METHODS FOR BCI** **9**

Classification techniques –Binary classification, Ensemble classification, Multiclass Classification, Evaluation of classification performance, Regression - Linear, Polynomial, RBF's, Perceptron's, Multilayer neural networks, Support vector machine, Graph theoretical functional connectivity analysis

**UNIT 5 APPLICATIONS OF BCI** **9**

Case Studies - Invasive BCIs: decoding and tracking arm (hand) position, controlling prosthetic devices such as orthotic hands, Cursor and robotic control using multi electrode array implant, Cortical control of muscles via functional electrical stimulation. Noninvasive BCIs: P300 Mind Speller, Visual cognitive BCI, Emotion detection, Ethics of Brain Computer Interfacing

**TOTAL: 45 PERIODS**

**TEXT BOOKS**


1. Ella Hassianien, A &Azar.A.T (Editors), "Brain-Computer Interfaces Current Trends and Applications", Springer, 2015.
2. Bernhard Graimann, Brendan Allison, Gert Pfurtscheller, "Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction", Springer, 2010.


**REFERENCES**


1. Ali Bashashati, Mehrdad Fatourechi, Rabab K Ward, Gary E Birch," A survey of signal Processing algorithms in brain–computer interfaces based on electrical brain signals" Journal of Neural Engineering, Vol.4, 2007, PP.32-57.
2. Arnon Kohen. "Biomedical Signal Processing", Vol I and II, CRC Press Inc, Boca Rato, Florida.
3. Bishop C.M., "Neural networks for Pattern Recognition", Oxford, Clarendon Press, 1995.
4. Andrew Webb, "Statistical Pattern Recognition", Wiley International, Second Edition, 2002.


Chairperson - BoS
Dept. of CSE - VCET

**e-RESOURSES:**

1. https://www.youtube.com/watch?v=WjEG0mv4O24
2. https://www.youtube.com/watch?v=rsehh0SgpZs
3. https://www.youtube.com/watch?v=LoGBCsFPNzU

## COURSE OUTCOMES

**Upon completion of the course, students will be able to:**

CO1 Comprehend and appreciate the significance and role of this course in the present contemporary world
CO2 Differentiate various concept of BCI.
CO3 Allocate functions appropriately to the human and to the machine.
CO4 Select appropriate for feature extraction methods.
CO5 Design a system using machine learning algorithms for translation.

**Mapping ofCOswithPOsandPSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | 3 | 1 | - | - | - | - | - | - | 1 | 1 | 2 |
| CO2 | 3 | - | - | 3 | 3 | - | - | - | - | - | - | 1 | 1 | 2 |
| CO3 | 3 | - | - | 3 | 3 | - | - | - | - | - | - | 1 | 1 | 2 |
| CO4 | 3 | - | - | 3 | 3 | - | - | - | - | - | - | 1 | 1 | 2 |
| CO5 | 3 | - | 3 | 3 | 3 | - | - | - | - | - | - | 1 | 1 | 2 |

1-Slight(Low),2-Moderate(Medium),3-Substantial(High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME44 | ROBOTICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Mathematics

**Preamble:** This course gives fundamental knowledge on the concepts and techniques of robot manipulator, its kinematics. It also familiarizes the students on various Programming and Machine Vision application in robots. It also builds confidence among students to evaluate, choose and incorporate robots in engineering systems.

**UNIT 1 FUNDAMENTALS OF ROBOT** **9**

Robot – Definition – Robot Anatomy – Co-ordinate systems, Work Envelope, types and classification – specifications – Pitch, yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and their functions – Need for Robots – Different Applications

**UNIT 2 ROBOT KINEMATICS** **9**

Forward kinematics, inverse kinematics and the difference: forward kinematics and inverse Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – derivations and problems. Homogeneous transformation matrices, translation and rotation matrices.

**UNIT 3 ROBOT DRIVE SYSTEMS AND END EFFECTORS** **9**

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of All These Drives. End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic grippers, vacuum grippers, internal grippers and external grippers, selection and design considerations of a gripper.

**UNIT 4 SENSORS IN ROBOTICS** **9**

Force sensors, touch and tactile sensors, proximity sensors, non-contact sensors, safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism. Machine vision system - camera, frame grabber, sensing and digitizing image data – signal conversion, image storage, lighting techniques, image processing and analysis – data reduction, segmentation, feature extraction, object recognition, other algorithms, applications – Inspection, identification, visual serving and navigation.

**UNIT 5 PROGRAMMING AND APPLICATIONS OF ROBOT** **9**

Teach pendant programming, lead through programming, robot programming languages – VAL programming – Motion Commands, Sensors commands, End-Effector Commands, and simple programs - Role of robots in inspection, assembly, material handling, underwater, space and medical fields.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Mikell.P.Groover , "Industrial Robotics – Technology, Programming and applications" McGraw Hill 2ND edition 2017.
2. Ganesh.S.Hedge,"A textbook of Industrial Robotics", Lakshmi Publications, 2006


**REFERENCES:**


1. Fu K.S. Gonalz R.C. and ice C.S.G."Robotics Control, Sensing, Vision and Intelligence", McGraw Hill book co. 2007.
2. YoramKoren, "Robotics for Engineers", McGraw Hill Book, Co., 2015.


**e-RESOURCES:**

1. https://nptel.ac.in/courses/107106090, "Introduction to robotics" by Dr. Krishna Vasudevan, Dr. T. Asokan, Dr. Balaraman Ravindran, IIT Madras.
2. https://onlinecourses.nptel.ac.in/noc19_me74/preview, "Robotics" by Prof.Dilip Kumar Pratihar, IIT Kharagpur.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Interpret various features of robots and the technology involved in robotics.
CO2 Apply basic engineering knowledge and laws for designing robots.
CO3 Choose the drive and gripper of a robot suitable for an environment.
CO4 Explain the image processing and image analysis techniques for machine vision system.
CO5 Develop a simple program for the working of a robot.

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 3 |
| **CO2** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 3 |
| **CO3** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 3 |
| **CO4** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 3 |
| **CO5** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME45 | FINTECH AND BLOCKCHAIN TECHNOLOGIES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Data Structures using Python

**Preamble:** Blockchain is a self-sustaining, peer to peer distributed database ledger technology for managing and recording transactions with no central regulatory and ownership involvement. It is like an online bank ledger, open to both parties in a transaction. Blockchain gained increasing importance because of its relevance in facilitating a single shared version of the truth for any digital asset

**UNIT 1 GETTING STARTED WITH BLOCK CHAIN** 9

What is Blockchain – Centralized Vs. Decentralized Systems – Layers of Blockchain – Why is Blockchain Important – Blockchain uses and Use Cases.

**UNIT 2 WORKING OF BLOCK CHAIN** 9

Blockchain foundation – Cryptography – Game Theory – Merkle Trees – Properties of Blockchain solutions – Blockchain Transactions – Distributed Consensus Mechanisms.

**UNIT 3 WORKING OF BITCOIN AND ETHERIUM** 9

Bitcoin Blockchain – The Bitcoin Network – Bitcoin Scripts – Bitcoin Wallets - Ethereum Blockchain - Transaction and Message Structure - Smart Contracts – Ethereum Virtual Machine

**UNIT 4 INTRODUCTION TO FINTECH** 9

Definition, History, concept, meaning, architecture, significance, Goals, key areas in FinTech, Importance of FinTech, role of FinTech in economic development, opportunities and challenges in FinTech, Evolution of FinTech in different sectors of the industry - Infrastructure, Banking Industry, Startups and Emerging Markets, recent developments in FinTech, future prospects and potential issues with FinTech.

**UNIT 5 PAYMENT INDUSTRY** 9

FinTech in Payment Industry-Multichannel digital wallets, applications supporting wallets, onboarding and KYC application, FinTech in Lending Industry- Formal lending, Informal lending, P2P lending, POS lending, Online lending, Payday lending, Microfinance, Crowd funding.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda, "Beginning Blockchain – A Beginner's Guide to Building Blockchain Solutions", Apress Publication, 2018.
2. Susanne Chishti, Janos Barberis, "The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries", Wiley Publications, 2016
3. Swee Won Lo Yu Wang David Kuo Chuen Lee, "Blockchain and Smart Contracts: Design Thinking and Programming for FinTech", Singapore University of Social Sciences - World Scientific Future Economy Series,2021.


Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Identify and explain the key benefits of block chain for a business or a network environment
CO2 Explain the components of block chain to develop a block chain system
CO3 Design a bitcoin wallet and Develop Ethereum Virtual Machine for the given business model.
CO4 Describe the history, importance and evolution of Fintech.
CO5 Analyze evolving financial landscapes in the payment industry to improve payment processes, financial services, and customer experiences.

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME46 | GAME DEVELOPMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Java Programming

**Preamble:** This course provides basic skills for conceptualizing, designing, implementing and testing the game. It majorly emphasizes on theoretical and practical approach to game design by utilizing standardized tools. The students will have a wider scope to develop their creative side and there is an emphasis on using their imagination to build and enrich the gaming experience

**UNIT 1 3D GRAPHICS FOR GAME DESIGN** **9**

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.

**UNIT 2 GAME DESIGN PRINCIPLES** **9**

Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction, Production and Post – Production.

**UNIT 3 GAME ENGINE DESIGN** **9**

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Path finding.

**UNIT 4 OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS** **9**

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity Single player and Multi-Player games.

**UNIT 5 GAME DEVELOPMENT USING PYGAME** **9**

Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Game.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Sanjay Madhav, "Game Programming Algorithms and Techniques: A Platform Agnostic Approach", Addison Wesley, 2013
2. Will McGugan, "Beginning Game Development with Python and Pygame: From Novice to Professional", Apress, 2007
3. Paul Craven, "Python Arcade games", Apress Publishers, 2016


**REFERENCES:**


1. David H. Eberly, "3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics", Second Edition, CRC Press,2006
2. Jung Hyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 2011


**e-RESOURCES:**

1. https://onlinecourses.nptel.ac.in/noc19_ge32/preview, Game Theory, by K.S. Mallikarjuna Rao, IIT Bombay.
2. https://www.coursera.org/specializations/game-design-and-development, Game Design and Development with Unity 2020 Specialization, Prof. Brian Winn, Michigan State University.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Explain the basic concepts of 2D and 3D Graphics for a game.
CO2 Summarize the script for preproduction, production and post – production of a game.
CO3 Choose gaming engines suitable for an environment.
CO4 Select a suitable platform and framework to design a game.
CO5 Develop a simple game using Pygame.

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 3 | 2 | 2 | - | - | 1 | 1 | - | - | - | 2 | 2 |
| **CO2** | 2 | 2 | 3 | 2 | 2 | - | - | 1 | 1 | - | - | - | 2 | 2 |
| **CO3** | 2 | 2 | 3 | 2 | 2 | - | - | 1 | 1 | - | - | - | 2 | 2 |
| **CO4** | 2 | 2 | 3 | 2 | 2 | - | - | 1 | 1 | - | - | - | 2 | 2 |
| **CO5** | 2 | 2 | 3 | 2 | 2 | - | - | 1 | 1 | - | - | - | 2 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME47 | 3D PRINTING AND DESIGN | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :**

***Preamble:*** *The course is aimed at giving exposure to and enhancing the knowledge and skills of fresh graduate engineers and engineers involved in the operation use of 3D Scanners and 3D printing / additive manufacturing with the aid of CAD packages. It gives exposure and on hand experience in the field of CAD packages, 3D Scanner and 3D Printing.*

**UNIT 1 INTRODUCTION** **9**

Introduction; Design considerations – Material, Size, Resolution, Process; Modelling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats.

**UNIT 2 PRINCIPLE** **9**

Processes – Extrusion, Wire, Granular, Lamination, Photo polymerisation; Materials - Paper, Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Graphene; Material Selection - Processes, applications, limitations.

**UNIT 3 INKJET TECHNOLOGY** **9**

Printer - Working Principle, Positioning System, Print head, Print bed, Frames, Motion control; Print head Considerations – Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication – Continuous jet, Mulitjet; Powder based fabrication – Colour Jet.

**UNIT 4 LASER TECHNOLOGY** **9**

Light Sources – Types, Characteristics; Optics – Deflection, Modulation; Material feeding and flow – Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures.

**Case Study:** Study 3D printer(s) including print heads, build envelope, materials used and related support removal system(s).

**UNIT 5 INDUSTRIAL APPLICATIONS** **9**

Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology, Displays; Future trends.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Christopher Barnatt, 3D Printing: The Next Industrial Revolution, CreateSpace Independent Publishing Platform, 2013
2. Ian M. Hutchings, Graham D. Martin, Inkjet Technology for Digital Fabrication, John Wiley & Sons, 2013
3. Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010


**REFERENCES:**


1. Ibrahim Zeid, Mastering CAD CAM Tata McGraw-Hill Publishing Co., 2007
2. Joan Horvath, Mastering 3D Printing, APress, 2014


**e-RESOURCES:**

1. https://archive.nptel.ac.in/courses/112/103/112103306/,"Fundamentals of Additive Manufacturing Technologies", Prof. Sajan Kapil, IIT Guwahati.
2. https://www.coursera.org/learn/introduction-to-3d-modeling, "Introduction to 3D Modeling", Prof. Glenn Wilcox, University of Michigan.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Outline and examine the basic concepts of 3D printing technology.
CO2 Apply the skills to work with 3D printing technologies.
CO3 Categorize the concepts and working principles of 3D printing using inkjet technique.
CO4 Explain the working principles of 3D printing using laser technique.
CO5 Illustrate various methods for designing and modeling of industrial applications.

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 3 | - | 3 | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **CO2** | 2 | 2 | 3 | - | 3 | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **CO3** | 2 | 2 | 3 | - | 3 | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **CO4** | 2 | 2 | 3 | - | 3 | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **CO5** | 2 | 2 | 3 | - | 3 | 1 | - | - | - | - | - | 1 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME48 | GENERATIVE AI | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites** : Artificial Intelligence, Machine Learning

***Preamble***

*Generative AI refers to a branch of artificial intelligence focused on creating new data instances that resemble real data. It involves the use of various techniques, including neural networks, to generate new content such as text, images, videos, and more. This course is designed to span a broad understanding of generative AI, covering theory, applications, challenges, practical implementation techniques, and leveraging it for content creation, programming tasks, website development, chatbots, and the lifecycle of Large Language Model (LLM)-based generative AI.*

**UNIT 1 INTRODUCTION TO GENERATIVE AI** 9

Introduction to Generative AI: Define Generative AI- how Generative AI works-Generative AI Applications- Challenges and Opportunities in Generative AI- ChatGPT: What is ChatGPT? - ChatGPT and its working. Prompt Engineering Fundamentals: What is a Prompt? - Elements of a Prompt- Evolution of Prompt Engineering- Tips for Designing Prompt- Case Study: Example Prompts for various use cases.

**UNIT II GENERATIVE AI FOR TEXTS, IMAGES AND VIDEOS** 9

**Generative Texts:** Introduction to AI Chatbots- Working of AI Chatbots- Popular AI Chatbots- How to use Chatbots- Usecases of Chatbots for various users. **Generative Images and Videos:** Role of AI in Image and Video Generation - Image Sourcing Vs Image Generation- Popular AI tools for Image Generation and Video Makers. Case Study - Prompts for Image Generation and AI Videos.

**UNIT 3 GENERATIVE CODES & OPENAI APIS** 9

**Generative Codes:** Role of AI Tools in Programming- Popular AI tools for Code Generation Build a website using Gen AI Tools. **OpenAI APIs** : Understanding OpenAI APIs - OpenAI playground-Creating API keys – Authentication - Making Requests. Case Study: Building AI Powered Chatbots.

**UNIT 4 FOUNDATIONS OF NEURAL NETWORKS AND DEEP LEARNING ARCHITECTURES** 9

**Neural Network Fundamentals**: From simple Perceptron to multi-layer perceptron and its training. **Deep Learning and its Architectures**: Introducing deep learning and architectures such as CNN, RNN, GAN and Transformers.

**UNIT 5 ADVANCED TOPICS IN DEEP LEARNING: TRANSFORMERS, LLMS GANS** 9

**Transformer and Large Language Model (LLM):** Fundamentals of Transformers Architecture - Applications of LLMs in Data Science- Use Cases and various Models for Natural Language Processing. **Training LLM for Natural Language Processing:** Training, Fine Tuning, Evaluation and Feedback through Reinforcement Learning. **Generative Adversarial Networks (GAN) for Image Generation:** Detailed description of GAN architecture- its training and variants.

**Total : 45 Periods**

Chairperson - BoS
Dept. of CSE - V...

**TEXT BOOKS:**

1. Modern Mind Publications, "Generative AI for Beginners Made Easy: Master Artificial Intelligence and Machine Learning Fundamentals, Learn Creative AI, and Enhance Your Skills With Interactive Real-World Exercises", Kindle Edition.
2. Ben Auffarth, "Generative AI with LangChain: Build large language model (LLM) apps with Python, ChatGPT, and other LLMs", Kindle Edition.

**REFERENCES:**


1 Bernard Marr, "Generative AI in Practice: 100+ Amazing Ways Generative Artificial Intelligence is Changing Business and Society", March 2024.

2 David Sweenor , Yves Mulkers, "Generative AI Business Applications: An Executive Guide with Real-Life Examples and Case Studies (TinyTechGuides)", Kindle Edition.

3. Divit Gupta and Anushree Srivastava, " The Potential of Generative AI: Transforming technology, business and art through innovative AI applications", Kindle Edition.

4. https://www.databricks.com/resources/ebook/big-book-generative-ai-"The Big Book of Generative AI-How to successfully build GenAI applications"


**Course Outcomes:Upon completion of the course, students will be able to:**

CO1 Provide a comprehensive understanding of Generative AI, covering theory, applications, challenges, and practical implementation techniques.

CO2 Leverage generative AI methods for creating content across text, images, and videos.

CO3 Gain proficiency in utilizing generative AI tools for programming tasks, website development, and creating AI-powered Chatbots.

CO4 Develop a comprehensive understanding of neural networks, from basic perceptrons to advanced architectures like CNNs, RNNs, GANs, and Transformers

CO5 Understand LLM-based generative AI lifecycle, from data gathering and model selection, to performance evaluation and deployment.

**Mapping of Cos with Pos and PSOs:**

| COs POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | 3 | 1 | - | - | 1 | - | - | 1 | 1 | 2 |
| **CO2** | 3 | 3 | 2 | 1 | 3 | 1 | - | - | 2 | 1 | - | 1 | 1 | 2 |
| **CO3** | 3 | 3 | 2 | 2 | 3 | 1 | - | 1 | 2 | 1 | - | 1 | 1 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 2 | - | 1 | 3 | 2 | - | 1 | 1 | 2 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | 2 | - | 1 | 3 | 3 | 3 | 1 | 1 | 2 |

1-Slight(Low),2-Moderate(Medium),3-Substantial(High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME51 | COGNITIVE SCIENCE AND ANALYTICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Nil

**Preamble**

*Information as representation of knowledge is the object of study of an emergent scientific field - Cognitive Science. Increasing applications in Human-centered design, the structural, functional and computational mechanisms of the brain are engaged. Understanding and predicting human behavior will help humans in exerting more control over situations. This will be useful in tackling everyday problems and attaining optimal solutions.*

**UNIT 1 PHILOSOPHY, PSYCHOLOGY AND NEUROSCIENCE** 9

Philosophy: Mental-physical Relation – From Materialism to Mental Science – Logic and the Sciences of the Mind – Psychology: Place of Psychology within Cognitive Science – Science of Information Processing – Cognitive Neuroscience – Perception – Decision – Learning and Memory – Language Understanding and Processing.

**UNIT 2 COMPUTATIONAL INTELLIGENCE** 9

Machines and Cognition – Artificial Intelligence – Architectures of Cognition – Knowledge Based Systems – Logical Representation and Reasoning – Logical Decision Making –Learning – Language – Vision- Case Study on reasoning algorithms

**UNIT 3 PROBABILISTIC PROGRAMMING LANGUAGE** 9

WebPPL Language – Syntax – Using Javascript Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Co-routines: Functions that receive continuations – Enumeration- Case Study on Mathematical functions using WebPPL.

**UNIT 4 INFERENCE MODELS OF COGNITION** 9

Generative Models – Conditioning – Causal and statistical dependence – Conditional dependence – Data Analysis – Algorithms for Inference-Case Study on Conditional inference learning model and Generative Model.

**UNIT 5 LEARNING MODELS OF COGNITION** 9

Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models– Learning (Deep) Continuous Functions – Mixture Models- Case Study on hierarchical model and Mixture model.

**Total : 45 Periods**

**TEXT BOOKS:**


1. Vijay V Raghavan,Venkat N.Gudivada, VenuGovindaraju, C.R. Rao, Cognitive Computing: Theory and Applications: (Handbook of Statistics 35), Elsevier publications, 2016
2. Jose Luis Bermúdez, Cognitive Science -An Introduction to the Science of the Mind, Cambridge University Press 2020.


Chairperson - BoS
Dept. of CSE - VCET

**REFERENCES:**


1. Judith Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big Data Analytics. Wiley Publications, 2015
2. Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences",The MIT Press, 2001.


**e-RESOURCES:**

1. https://onlinecourses.nptel.ac.in/noc20_hs29/preview, "Introduction to Cognitive Psychology", By Prof. Naveen Kashyap, IIT Guwahati.
2. https://onlinecourses.nptel.ac.in/noc22_ee122/preview, "Cognition and its computation", Prof. Sharba Bandyopadhyay and Prof. Rajlakshmi Guha , IIT- Kharagpur.

**Course Outcomes:** Upon completion of this course, students will be able to:

| | |
|---|---|
| CO1 | Understand the underlying theory behind cognition from materialism to mental Science. |
| CO2 | Apply suitable Logical Representation and Reasoning to the cognition elements computationally |
| CO3 | Implementing mathematical functions through WebPPL by using probabilistic programming language. |
| CO4 | Develop applications using cognitive inference model and generative models for interactions |
| CO5 | Develop applications using cognitive learning model to learn new things faster. |

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | - | 2 | 1 | 2 | - | - | - | 1 | 1 | 2 |
| **CO2** | 3 | 2 | 2 | 2 | - | 2 | 1 | 2 | - | - | - | 1 | 1 | 2 |
| **CO3** | 3 | 2 | 2 | 2 | - | 2 | 1 | 2 | - | - | - | 1 | 1 | 2 |
| **CO4** | 3 | 2 | 2 | 2 | - | 2 | 1 | 2 | - | - | - | 1 | 1 | 2 |
| **CO5** | 3 | 2 | 2 | 2 | - | 2 | 1 | 2 | - | - | - | 1 | 1 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME52 | NEURAL NETWORKS AND DEEP LEARNING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites:-**

**Preamble**

*To introduce third-generation neural networks such as spiking neural networks and convolutional neural networks, emphasizing their applications in computer vision, image generation, and compression. Additionally, learners will explore deep feedforward networks, recurrent neural networks, and their applications in natural language processing and other domains, while also gaining insights into regularization techniques and advanced concepts like complete autoencoders.*

**UNIT 1 INTRODUCTION** **9**

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An IntroductionEvolution of Neural Networks-Basic Models of Artificial Neural Network- Important Terminologies of ANNs-Supervised Learning Network

**UNIT 2 ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS** **9**

Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network

**UNIT 3 THIRD-GENERATION NEURAL NETWORKS** **9**

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.

**UNIT 4 DEEP FEEDFORWARD NETWORKS** **9**

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.

**UNIT 5 RECURRENT NEURAL NETWORKS** **9**

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders

**Total : 45 PERIODS**

**TEXT BOOKS:**


1. Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016


**REFERENCES:**


1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly, 2018
2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017
3. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 1st Edition, 2018


**e-RESOURCES:**

1. https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteenchallenges-and-opportunities/
2. https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Apply Convolution Neural Network for image processing

CO2 Explain the basics of associative memory and unsupervised learning networks

CO3 Apply CNN and its variants for suitable applications

CO4 Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks

CO5 Apply autoencoders and generative models for suitable applications

**Mapping of COs with POs and PSOs**

| COs\POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 | 3 | 1 | - | - | 2 | 1 | - | - | 3 | 1 |
| CO2 | 3 | 1 | 2 | 1 | - | - | - | - | - | 1 | 2 | 2 | 3 | - |
| CO3 | 3 | 3 | 3 | 3 | 3 | 1 | - | - | 2 | 1 | - | - | 3 | 1 |
| CO4 | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 3 | 3 | 2 |
| CO5 | 1 | 1 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME53 | SOFT COMPUTING | L T P C<br>3 0 0 3 |
|---|---|---|

**Preamble :**

*This course gives an introduction to some new fields in soft computing with its principal components of fuzzy logic, Neural networks and GA. Students are able to understand the real time applications of these soft computing components with hybridization.*

**UNIT 1 INTRODUCTION** **9**

Introduction to soft computing- Introduction to Artificial Intelligent Systems- Neural Networks- Fuzzy Logic-Genetic Algorithms-Hybrid systems

**UNIT 2 NEURAL NETWORKS** **9**

Basic Concepts of Neural Networks- Neural Network Architectures-Pattern Classifiers-Pattern Associators- Supervised learning Networks: Adaptive linear neuron- Backpropagation Learning. Associative memory networks: Associative Memory-Unsupervised learning networks: Adaptive Resonance Theory-Third generation neural networks

**UNIT 3 FUZZY LOGIC** **9**

Fuzzy Sets- Fuzzy membership functions-Operations on Fuzzy Sets -Fuzzy relations- Fuzzy Logic Basics-Fuzzy Rules- Fuzzy Reasoning- Fuzzy Inference Systems

**UNIT 4 GENETIC ALGORITHMS** **9**

Basic Concepts-Working Principle-Traditional optimization and search techniques-Genetic algorithm and search space- Genetic algorithm and traditional algorithm- Operators: Encoding-Selection- Cross Over-Mutation - Fitness computations-Swarm Intelligence- Applications of Genetic Algorithm: Optimization of Traveling Salesman problem using GA approach

**UNIT 5 HYBRID SOFT COMPUTING TECHNIQUES** **9**

Fuzzy-neural Systems: Fuzzy Neurons-Adaptive Neuro-fuzzy Inference System- Neuro-genetic Systems: GA based Back Propagation Network- Genetic fuzzy hybrid: Genetic fuzzy rule based system.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", 3rd Edition, Wiley India Pvt. Ltd, 2019.
2. Samir Roy, Udit Chakroborthy, "Introduction to soft computing -neuro-fuzzy and genetic algorithms", Pearson Education, 1st Edition, 2013.


**REFERENCES:**


1. David E. Goldberg, "Genetic Algorithms in Search, Optimization & Machine Learning", Pearson Education, 2013.
2. S.Rajasekaran and G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications", Prentice-Hall of India Pvt. Ltd., 2012.
3. Timothy J.Ross, "Fuzzy Logic with Engineeringapplications", Tata McGraw Hill New York, Third edition, 2010.


**e. RESOURCES :**

1. http://nptel.ac.in/courses/112106064/38/, "Genetic Algorithms", Prof. C. Balaji, IIT- Madras.
2. http://nptel.ac.in/courses/108104049/13/,"Fuzzy Sets: A Primer", Prof. Laxmidhar Behera, IIT-Kanpur.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Identify and describe soft computing techniques and their roles in building intelligent machines.

**CO2** Discuss the components of neural network architecture and explain supervised and unsupervised learning algorithms using Backpropagation, Associative Memory and Adaptive Resonance.

**CO3** Explain the fuzzy sets, fuzzy logic systems and its applications in real life problem solving.

**CO4** Discuss the core of genetic algorithms and its applicationto combinatorial optimization problems.

**CO5** Analyze the problem for optimal solution by hybridizing Neuro-Fuzzy and Neuro-Geneticsoft computing techniques.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | 2 |
| **CO 2** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | 2 |
| **CO 3** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | 2 |
| **CO 4** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | 2 |
| **CO 5** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME54 | COMPUTER VISION | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites :**

**Preamble :**

*Embarking on the captivating journey of Computer Vision, this syllabus unravels the intricacies of perceiving, analyzing, and understanding visual information. From foundational concepts to advanced techniques, students will traverse through image processing fundamentals, feature extraction methods, and machine learning algorithms tailored for visual data analysis. Delving deeper, the syllabus explores object recognition, scene understanding, and 3D reconstruction, culminating in cutting-edge applications like deep learning for image classification and generative adversarial networks for image synthesis. Through theoretical insights and practical implementations, this curriculum equips learners with the knowledge and skills to unravel the mysteries of the visual world and innovate in domains ranging from robotics to healthcare.*

**UNIT 1 INTRODUCTION TO IMAGE FORMATION AND PROCESSING 9**

Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization

**UNIT 2 FEATURE DETECTION, MATCHING AND SEGMENTATION 9**

Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods

**UNIT 3 FEATURE-BASED ALIGNMENT & MOTION ESTIMATION 9**

2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.

**UNIT 4 3D RECONSTRUCTION 9**

Shape from X - Active rangefinding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.

**UNIT 5 IMAGE-BASED RENDERING AND RECOGNITION 9**

View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Texts in Computer Science, Second Edition, 2022.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015

**REFERENCES:**

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006

**e. RESOURCES :**

1. https://onlinecourses.nptel.ac.in/noc19_cs58/preview, "Computer Vision" by Prof. Jayanta Mukhopadhyay, IIT Kharagpur
2. https://onlinecourses.nptel.ac.in/noc21_cs93/preview, "Deep Learning for Computer Vision" by Prof. Vineeth N Balasubramanian, IIT Hyderabad

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Understand basic knowledge, theories and methods in image processing and computer vision.
**CO2** Implement basic and some advanced image processing techniques in OpenCV
**CO3** Apply 2D a feature-based based image alignment, segmentation and motion estimations
**CO4** Apply 3D image reconstruction techniques
**CO5** Design and develop innovative image processing and computer vision applications

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 2 | 1 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 | 3 |
| **CO 2** | 2 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 | 3 |
| **CO 3** | 2 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 | 3 |
| **CO 4** | 2 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 | 3 |
| **CO 5** | 2 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| | | L T P C |
|---|---|---|
| 22AME55 | TINY ML | 3 0 0 3 |

**Preamble :**

*Ideal for software and hardware developers who want to build embedded systems using machine learning, this guide walks you through creating a series of TinyML projects, step-by-step.*
*No machine learning or microcontroller experience is necessary.*

**UNIT 1 INTRODUCTION TO TINYML** **9**

Introduction- AI and ML – ML Disruption – Basics of TinyML – Need for TinyML – Benefits of TinyML – TinyML Applications – Hardware for TinyML applications – TinyML with Examples.

**UNIT 2 AMERICAN SIGN LANGUAGE** **8**

Introduction to ASL – Why use TinyML for ASL - Applications of ASL - No-Code Deep Learning model - Low Code Deep Learning Model.

**UNIT 3 AUDIO AND VISUAL WAKE-WORD DETECTION** **10**

**Audio Wake-Word Detection :**Introduction - Algorithms For Wake Word detections – Applications of wake words - TinyML and Wake Word Detection - Inputs of the Wake Word Model. **Visual Wake Word Detection:** Introduction - Visual AI/ Computer Vision - Applications and the Scale of Computer Vision - Computer Vision and TinyML - Visual Wake Word vs. Audio Wake Word - Defining Inputs and Outputs of the VWW Application.

**UNIT 4 PREDICTIVE MAINTENANCE** **9**

Introduction - Predictive Maintenance Solution Interface - Sensors and Analysis - Industry 4.0 Applications - TinyML and Predictive Maintenance - Sensors and Interface - Sensor Data and Equipment state - No-Code Deep Learning App.

**UNIT 5 DEEPSEA COMPILER** **9**

TinyML Compiler - Types of Compilers – Introduction to DeepSea - The deepSea Features - deepSea Technology - deepSea Operators - Applications of deepSea - deepSea Scripting Using Python - Microcontrollers Support in deepSea.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. "Introduction to TinyML " by AI Technology & Systems, 2022.

**REFERENCES:**

1. M Ashraf Rizvi, "Effective Technical Communication", McGraw-Hill, 2nd Edition, New Delhi, 2018.
2. Sanjay Kumar and Pushp Lata, "Communication Skills: A Workbook, Oxford University Press, 2020.
3. J K Gangal, "A Practical course in Spoken English", PHI Learning Pvt. Ltd., 1st Edition, Delhi, 2014.

**e. RESOURCES :**

1. https://medium.com/ai-techsystems/download-book-on-introduction-to-tinyml-d292123dc817
2. https://www.packtpub.com/product/tinyml-cookbook-second-edition/9781837637362

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Understand the concepts of TinyML.
**CO2** Develop programs using ASL
**CO3** Explain and define algorithms for visual wake-word detection
**CO4** Understand and develop application using No code deep learning model
**CO5** Develop deepSea Scripting Using Python

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO 2** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO 3** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 3 | 2 |
| **CO 4** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 3 | 2 |
| **CO 5** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME56 | AUTO ML | L T P C<br>3 0 0 3 |
|---|---|---|

**Preamble**

*Automated Machine Learning (AutoML) emerges as a transformative force, revolutionizing how we approach model development and deployment. Automation in machine learning embodies the principles of scalability, repeatability, and agility, offering a transformative approach to the entire data-driven workflow.*

**UNIT 1 INTRODUCTION TO AUTOMATED MACHINE LEARNING** **9**

The ML development life cycle-Automated ML-How automated ML works-Democratization of data science-Debunking automated ML myths-Automated ML ecosystem-Open source platforms and tools-Commercial tools and platforms.

**UNIT 2 AUTOMATED MACHINE LEARNING ALGORITHMS AND TECHNIQUES** **9**

Automated Machine Learning, Algorithms, and Techniques-Automated ML – Opening the hood-Automated feature engineering-Hyperparameter optimization-Neural architecture search.

**UNIT 3 AUTOMATED MACHINE LEARNING ALGORITHMS WITH OPEN SOURCE TOOLS** **9**

The open source ecosystem for AutoML-Introducing TPOT- Feature tools- Introducing Microsoft NNI-auto-sklearn-AutoKeras-AutoGluon – the AutoML toolkit for deep learning

**UNIT 4 AUTOML WITH CLOUD PLATFORMS** **9**

Getting started with Azure Machine Learning-The Azure Machine Learning stack- Azure Machine Learning service-Modeling –Deploying and testing models.

**UNIT 5 AUTOML IN ENTERPRISE** **9**

Automated ML – an accelerator for enterprise advanced analytics-Automated ML challenges and opportunities-Establishing trust – model interpretability and transparency in automated ML-Case Study : Introducing automated ML in an organization.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. "Automated Machine Learning", Adnan Masood, Packt publisher, February 2021.

**REFERENCES:**

1. Frank Hutter Lars Kotthoff Joaquin Vanschoren Editors "Automated Machine Learning Methods", Systems, Challenge.
2. "Automated Machine Learning in Action", Qingquan Song, Haifeng Jin, and Xia Hu March **2022.**

**e. RESOURCES :**

1. https://www.oreilly.com/library/view/hands-on-automated-machine/9781788629898/8fe2c37f-2f15-4db7-8167-865037ee94a8.xhtml

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| **CO1** | Understand the basic concepts of Machine learning and its tools. |
| **CO2** | Explain Machine Learning Algorithms and Techniques like feature engineering and hyperparameter optimization. |
| **CO3** | Compare Automated Machine Learning Algorithms with Open Source Tools. |
| **CO4** | Discuss the relationship between AutoML with Cloud Platforms. |
| **CO5** | Apply AutoML in Enterprise along with Automated ML challenges and opportunities. |

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | 2 | - | - | - | 1 | - | 2 | 1 | 1 | 2 |
| **CO2** | 3 | 2 | 2 | 1 | 2 | - | - | - | 1 | - | 2 | 1 | 1 | 2 |
| **CO3** | 3 | 2 | 2 | 1 | 2 | - | - | - | 1 | - | 2 | 1 | 1 | 2 |
| **CO4** | 3 | 2 | 2 | 1 | 2 | - | - | - | 1 | - | 2 | 1 | 1 | 2 |
| **CO5** | 3 | 2 | 2 | 1 | 2 | - | - | - | 1 | - | 2 | 1 | 1 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

22AME57

## ML OPERATING SYSTEMS

L T P C
3 0 0 3

**Preamble :**

*Getting your models into production is the fundamental challenge of machine learning. MLOps offers a set of proven principles aimed at solving this problem in a reliable and automated way. This insightful guide takes you through what MLOps is (and how it differs from DevOps) and shows you how to put it into practice to operationalize your machine learning models.*

**UNIT 1 INTRODUCTION TO MLOPS** 9

Introduction-DevOps and MLOps- MLOps Hierarchy of Needs . MLOps Foundations: Bash and the Linux Command Line - Cloud Shell Development Environments - Bash Shell and Commands - Cloud Computing Foundations and Building Blocks - Build an MLOps Pipeline from Zero.

**UNIT 2 MLOPS FOR CONTAINERS AND EDGE DEVICES** 8

**Containers:** Container Runtime - Creating a Container - Running a Container - Best Practice - Serving a Trained Model Over HTTP. **Edge Devices:** Coral - Azure Percept – TFHub - Porting Over Non-TPU Models - Containers for Managed ML Systems.

**UNIT 3 AUTOML AND KAIZENML** 10

AutoML - Kaizen Versus KaizenML - Apple's Ecosystem - Google's AutoML and Edge Computer Vision - Azure's AutoML - AWS AutoML - Open Source AutoML Solutions.

**UNIT 4 MLOPS FOR AWS** 9

Introduction to AWS - MLOps Cookbook on AWS - AWS Lambda Recipes - Applying AWS Machine Learning to the Real World.

**UNIT 5 MLOPS FOR AZURE** 9

MLOps for Azure: Azure CLI and Python SDK – Authentication - Compute Instances – Deploying - Deploying Models to a Compute Cluster - Troubleshooting Deployment Issues - Azure ML Pipelines.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Noah Gift, Alfredo Deza "Practical MLOps "O'Reilly Media, Inc., September 2021.

**REFERENCES:**

1.https://www.databricks.com/resources/ebook/the-big-book-of-mlops
2.https://www.ai-startups.org/books/mlops/#download
3.https://huyenchip.com/mlops/

**e. RESOURCES :**

1. https://www.databricks.com/resources/ebook/the-big-book-of-mlops
2. https://www.ai-startups.org/books/mlops/#download

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Understand the concepts of MLops.
**CO2** Explain the concepts of MLops for containers and edge devices.
**CO3** Develop solutions for given problem using Automl and Kaizenml
**CO4** Understand and develop AWS machine learing applications for real world problem
**CO5** Troubleshoot deployment issues in Azure.

Chairperson - BoS
Dept. of CSE - VCET

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO 2** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO 3** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 3 | 2 |
| **CO 4** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 3 | 2 |
| **CO 5** | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | 2 | 1 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME58 | ETHICS & AI | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites :**

**Preamble :**

*In the study of ethics and AI, the complex interplay between technological advancement and moral responsibility is confronted. Guided by principles of accountability, fairness, and respect for human autonomy, challenges of bias, transparency, and societal impact are navigated through. A culture of ethical reflection and dialogue is sought to be fostered, ensuring that artificial intelligence serves as a force for good, enriching human experiences and promoting social justice.*

**UNIT 1 INTRODUCTION** **9**

Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet-Impact on trust

**UNIT 2 ETHICAL INITIATIVES IN AI** **9**

International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles , Warfare and weaponization

**UNIT 3 AI STANDARDS AND REGULATION** **9**

Model Process for Addressing Ethical Concerns During System Design - Transparency of Autonomous Systems-Data Privacy Process- Algorithmic Bias Considerations - Ontological Standard for Ethically Driven Robotics and Automation Systems

**UNIT 4 ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS** **9**

Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology - Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional Responsibility Roboethics Taxonomy

**UNIT 5 AI AND ETHICS- CHALLENGES AND OPPORTUNITIES** **9**

Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield, "The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020
2. Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.


**REFERENCES:**


1. Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms) by Paula Boddington, November 2017.
2. Mark Coeckelbergh," AI Ethics", The MIT Press Essential Knowledge series, April 2020


**e. RESOURCES :**

1. https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteenchallenges-and-opportunities/
2. https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

- **CO1** Analyze the impact of AI on society, human psychology, the legal system, the environment, and trust.
- **CO2** Identify and assess ethical harms and concerns in healthcare robots, autonomous vehicles, and warfare.
- **CO3** Analyze ontological standards for ethically driven robotics and automation systems
- **CO4** Evaluate ethical issues in science, technology, and ICT society
- **CO5** Assess the role of AI in decision-making processes in various sectors

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 2 | 3 | 3 | 1 | - | - | - | 1 | 2 | 1 | 1 | 3 | 2 |
| **CO 2** | 2 | 1 | 1 | 2 | 1 | - | - | - | 1 | 2 | 1 | 1 | 3 | 2 |
| **CO 3** | 2 | 3 | 1 | 1 | 3 | - | - | - | 2 | 1 | 1 | 2 | 3 | 2 |
| **CO 4** | 3 | 1 | 3 | 3 | 2 | - | - | - | 2 | 2 | 3 | 1 | 3 | 2 |
| **CO 5** | 3 | 1 | 1 | 3 | 3 | - | - | - | 2 | 3 | 3 | 3 | 3 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME61 | MOBILE COMMUNICATION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Analog and Digital Data Communication / Digital Electronics /Computer Networks

**Preamble:**

*This course provides knowledge about mobile communication system and familiarizes network layer protocols and Ad-Hoc networks. It majorly emphasizes on different mobile platforms and application development concepts.*

**UNIT 1 INTRODUCTION TO MOBILE COMMUNICATION** **9**

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies (1G,2G,3G,4G,5G)- Multiplexing – Spread spectrum - MAC Protocols – SDMA- TDMA- FDMA-OFDMA - CDMA – Massive MIMO

**UNIT 2 MOBILE TELECOMMUNICATION SYSTEM** **9**

Introduction to Cellular Systems - GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security- Bluetooth – Li-Fi.

**UNIT 3 MOBILE NETWORK LAYER** **9**

Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks ( VANET) –MANET Vs VANET – Security

**UNIT 4 MOBILE TRANSPORT AND APPLICATION LAYER** **9**

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

**UNIT 5 MOBILE PLATFORMS AND APPLICATIONS** **9**

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

**Total : 45 Periods**

**TEXT BOOKS:**


1. Jochen Schiller, —Mobile Communications, PHI, Second Edition, Reprint edition 2008.
2. Prasant Kumar Pattnaik, Rajib Mall, —Fundamentals of Mobile Computingl, PHI Learning Pvt.Ltd, New Delhi – 2019


**REFERENCES:**


1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems",Thomson Asia Pvt Ltd, 2010
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, —Principles of Mobile Computingl, Springer, 2006.
3. William.C.Y.Lee,—Mobile Cellular Telecommunications-Analog and Digital Systemsl, Second Edition,TataMcGraw Hill Edition ,2006.


Chairperson - BoS
Dept. of CSE - VCET

**e-RESOURCES:**

1. Android Developers : http://developer.android.com/index.html
2. Windows Phone DevCenter : http://developer.windowsphone.com
3. https://nptel.ac.in/courses/106106147
4. https://alison.com/course/introduction-to-mobile-and-cloud-computing-revised

**Course Outcomes:** Upon completion of this course, students will be able to:

| | |
|---|---|
| CO1 | Explain the basics of mobile telecommunication systems. |
| CO2 | Illustrate the generations of telecommunication systems in wireless networks |
| CO3 | Determine the functionality of MAC, network layer and Identify appropriate routing protocol for a given Ad hoc network |
| CO4 | Explain the functionalities and architecture of mobile Transport and Application layers |
| CO5 | Develop a mobile application using android/blackberry/ios/Windows SDK |

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | - | - | - | - | - | - | - | 1 | 1 | 2 | - | 2 |
| **CO2** | 3 | 3 | - | - | - | - | - | - | - | 1 | 1 | 2 | - | 2 |
| **CO3** | 3 | 3 | 2 | - | - | - | - | - | - | 1 | 1 | 2 | - | 2 |
| **CO4** | 3 | 3 | 2 | 2 | 2 | - | - | - | - | 1 | 1 | 2 | - | 2 |
| **CO5** | 3 | 3 | 2 | 2 | 2 | - | - | - | - | 1 | 1 | 2 | 3 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME31 | DISTRIBUTED COMPUTING | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites :** Computer Networks

**Preamble :**

*A distributed system is a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another.The components interact with one another in order to achieve a common goal.An application of distributed systems includes multiplayer online games, websearch, mobile and ubiquitous computing, finance and trading systems.*

**UNIT 1 INTRODUCTION** 9

Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web- System models-Physical model-Architectural model-Fundamental model.

**UNIT 2 COMMUNICATION IN DISTRIBUTED SYSTEM** 9

Inter process Communication - the API for internet protocols – External data representation and marshalling- Remote Invocation – Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI – Group communication - Publish-subscribe systems - Message queues - Shared memory approaches.

**UNIT 3 DISTRIBUTED FILE SYSTEM AND NAME SERVICES** 9

Distributed File Systems –Introduction – File service architecture –Andrew File system. **Case study:** Google File system. Naming - Introduction-Name services and domain name system-Directory Services-Peer to peer Systems-Napster-Peer to peer middleware- Routing overlays.

**UNIT 4 DISTRIBUTED TRANSACTIONS AND CONCURRENCY CONTROL** 9

Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks– Coordination and Agreement – Introduction - Distributed mutual exclusion algorithms – Election algorithms – Distributed Transactions– Flat and nested distributed transactions-Atomic Commit protocols – Concurrency control in Distributed systems- Distributed deadlocks-Transaction Recovery

**UNIT 5 PROCESS & RESOURCE MANAGEMENT** 9

**Process Management:** Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. **Resource Management:** Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. GeorgeCoulouris,JeanDollimoreandTimKindberg,"DistributedSystemsConceptsandDesign",FifthEdition,PearsonEducation,2012.

**REFERENCES:**

1. Pradeep, "Distributed K Sinha Operating Systems: Concepts and Design", Prentice Hall of India,2012

**e. RESOURCES :**

1. https://nptel.ac.in/courses/106106107/,"InterprocessCommunication",Prof.AnanthanarayanaVS,DepartmentofInformationTechnology,NITK,Surathkal
2. https://onlinecourses.nptel.ac.in/,"Timeandglobalstates",Dr.RajivMisra,DepartmentofComputerScienceandEngineering,IIT,Patna

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| **CO1** | Discuss resource sharing principles, trends and challenges in a distributed system using World Wide Webas a case study. |
| **CO2** | Illustrate process communication using remote method invocation for a given distributed environment. |
| **CO3** | Describe the file systems for a distributed environment using distributed file service implementations. |
| **CO4** | Apply suitable concurrency control method to ensure multiple transactions to maintain ACID property and serializability in the schedules. |
| **CO5** | Explain process and resource management policies for a given distributed environment using schedulingalgorithms. |

**Mapping ofCOswithPOsandPSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | - | - | - | - | - | - | 1 | - | 1 | - | 2 |
| **CO 2** | 3 | 3 | 2 | - | - | - | - | - | - | 1 | - | 1 | - | 2 |
| **CO 3** | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 | - | 1 | - | 2 |
| **CO 4** | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 | - | 1 | - | 2 |
| **CO 5** | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 | - | 1 | - | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME63 | AD HOC AND WIRELESS SENSOR NETWORKS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :** Computer Networks

**Preamble:** *This course enables the student to understand the fundamental concepts of adhoc wireless sensor networking system that facilitate the erection of infrastructure less networks in unknown time and place, MAC Protocol, routing and transport layer protocol design issues. This course enables the students to evaluate the QoS related performance measurements of ad hoc and sensor networks.*

**UNIT 1 TUNING TO SENSOR NETWORKS FUNDAMENTALS** **9**

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the wireless channel – Mobile Ad hoc Networks (MANETs) and Wireless Sensor networks (WSNs): concepts and architectures – Applications of Ad Hoc and Sensor networks – DesignChallenges in Ad hoc and Sensor Networks

**UNIT 2 MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS** **9**

Issues in designing a MAC Protocol – Classification of MAC Protocols – Contention based protocols – Contention based protocols with Reservation Mechanisms – Contention based protocols with Scheduling Mechanisms – Multi channel MAC – IEEE 802.11.

**UNIT 3 ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS** **9**

Issues in designing a routing and Transport Layer protocol for Ad hoc networks – proactive routing, reactive routing (on – demand), hybrid routing – Classification of Transport Layer solutions – TCP over Ad hoc networks.

**UNIT 4 WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS** **9**

Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures – data relaying and aggregation strategies – MAC layer protocols: self – organizing, Hybrid TDMA/FDMA and CSMA based MAC – IEEE 802.15.4 – Case study: Wireless Sensor Network in Sustainable Agriculture.

**UNIT 5 WSN ROUTING, LOCALIZATION & QOS** **9**

Issues in WSN routing – OLSR – Localization – Indoor and Sensor Network Localization – absolute and relative localization, triangulation – QOS in WSN – Energy Efficient Design – Synchronization – Transport Layer Issues – Case study: WBAN revisited.

**Total : 45 Periods**

**TEXT BOOKS:**


1. C. Siva Ram Murthy, and B. S. Manoj, "Ad hoc Wireless Networks: Architectures and Protocols", Prentice Hall Professional Technical Reference, First Edition,2008
2. Kazem Sohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2010.


**REFERENCES:**


1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
2. Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication – 2004.
3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005.
4. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.


Chairperson - BoS
Dept. of CSE - VCET

**e-RESOURCES:**

1. http://nptel/courses/video/106105160/, "Medium Access Control in Wireless Networks", Prof Sudip Misra, IIT - Kharagpur.
2. https://nptel.ac.in/courses/106105160/, "Introduction: Wireless Ad Hoc Networks", Prof Sudip Misra, IIT - Kharagpur.

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Outline the fundamentals of wireless communication technology that facilitate the insight of infrastructure less networks formation, application and design issues of the given Ad hoc and Sensor networks

CO2 Describe the MAC Protocol designing issues and contention–based algorithms with reservation and scheduling to achieve node mobility, time synchronization, bandwidth efficiency and QoS support for the given Ad hoc wireless network

CO3 Explain the issues behind the routing protocol blueprint and classification in transport layer to suit with Ad hoc Wireless Network

CO4 Delineate the MAC layer protocols to emphasize the energy efficient operation, efficient neighbor discovery and channel assignment operations for the Wireless sensor networks

CO5 Discuss the architecture, data handling and localization techniques to optimize the location discovery of sensor nodes for the given wireless sensor networks

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 1 | - | - | - | - | - | - | - | - | - | 1 |
| **CO2** | 3 | 2 | - | 1 | - | - | - | - | - | 1 | - | - | - | 1 |
| **CO3** | 3 | 2 | - | 1 | - | - | 1 | - | - | 2 | - | - | - | 2 |
| **CO4** | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | 2 | - | 1 |
| **CO5** | 3 | 2 | 2 | 1 | - | - | - | 1 | - | - | - | 2 | - | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

**22AME64** **ETHICAL HACKING** **L T P C**
**3 0 0 3**

**Pre-requisites :** Cryptography And Network Security

**Preamble :**

*This course enables the learner to learn ethical hacking and security challenges in computer networking. Whichaddresses the data security issues and types of attacks includes malwares, viruses, sniffer and denial of service. Itteaches wireless hacking and hacking in operating system environments. Learners also learn how to protect thenetwork system using firewalls andfilters and also about the legal,professional and ethical issues.*

**UNIT 1 INTRODUCTION** **9**

EthicalHackingOverview-RoleofSecurityandPenetrationTesters.-Penetration-TestingMethodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer -The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware - Protecting AgainstMalware Attacks.-IntruderAttacks -AddressingPhysicalSecurity.

**UNIT 2 FOOT PRINTING,RECONNAISSANCEANDSCANNINGNETWORKS** **9**

Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites,Website, Email - Competitive Intelligence - Footprinting through Social Engineering-Footprinting Tools - Network Scanning Concepts – Port - Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall.

**UNIT 3 ENUMERATION AND VULNERABILITY ANALYSIS** **9**

Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities-Vulnerabilities of Embedded Oss.

**UNIT 4 SYSTEM HACKING** **9**

Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving Wireless Hacking-Tools of the Trade

**UNIT 5 NETWORK PROTECTION SYSTEMS** **9**

Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network-Based and Host-Based IDSs and IPSs- WebFiltering –Security Incident Response Teams–Honey pots.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. MichaelT. Simpson, Kent Backman, and JamesE. Corley, Hands-OnEthicalHacking andNetworkDefense,Course Technology,DelmarCengage Learning,2010.
2. Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.
3. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Dafydd Stuttard and Marcus Pinto, 2011.


**REFERENCES:**


1. Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz , 2014.


Chairperson - BoS
Dept. of CSE - VCET

**e. RESOURCES :**

1. https://onlinecourses.nptel.ac.in/noc22_cs13/preview

**Course Outcomes:** Upon completion of the course, students will be able to:

| | |
|---|---|
| **CO1** | Classify computer based vulnerabilities and distinguish the type of security threat for given situation. |
| **CO2** | Apply appropriate foot printing and port scanning tools for a given scenario. |
| **CO3** | Use enumeration and vulnerability analysis techniques for a given scenario in different operating systems. |
| **CO4** | Describe various hacking options available in web applications in wired and wireless networks . |
| **CO5** | Illustrate Risk Analysis Tools, Honeypots for network protection. |

**Mapping ofCOswithPOsandPSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 2 | 2 | 2 | - | - | 1 | - | 1 | 2 | - | 1 | 1 | 2 |
| **CO 2** | 3 | 2 | 1 | 1 | 3 | - | 1 | - | 2 | 1 | 1 | 1 | 1 | 2 |
| **CO 3** | 3 | 2 | 2 | 1 | 3 | - | 1 | - | 1 | 2 | 1 | 1 | 1 | 2 |
| **CO 4** | 3 | 1 | 1 | 2 | 3 | - | 1 | - | 1 | 2 | 1 | 1 | 1 | 2 |
| **CO 5** | 3 | 3 | 1 | 1 | 3 | - | 1 | - | 2 | 1 | 1 | 1 | 1 | 1 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

22AME33 **SECURITY AND PRIVACY IN CLOUD** L T P C
3 0 0 3

**Pre-requisites : Computer Networks, Cloud Computing, Network Security**

**Preamble:**

*The course covers the fundamental Cloud Computing terminology, definition & concepts. Ithelps students to understand the security design and architectural considerations for Cloud. It also makesthe students to get familiar with the Identity, Access control in Cloud. The best practices for Cloudsecurity using various design patterns are discussed. This also introducers learners to monitor and audit cloud applications for security.*

**UNIT 1 FUNDAMENTALS OF CLOUD SECURITY CONCEPTS** 9

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non-repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

**UNIT 2 SECURITY DESIGN AND ARCHITECTURE FOR CLOUD** 9

Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key.

**UNIT 3 ACCESS CONTROL AND IDENTITY MANAGEMENT** 9

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention.

**UNIT 4 CLOUD SECURITY DESIGN PATTERNS** 9

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud. Case study Example

**UNIT 5 MONITORING, AUDITING AND MANAGEMENT** 9

Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management. Case study Example

**Total : 45 Periods**

**TEXT BOOKS:**


1. Raj Kumar Buyya , James Broberg, Andrzej Goscinski, "Cloud Computing:Principles and Paradigms", Wiley 2013
2. Dave Shackleford, "Virtualization Security:Protecting Virtualized Environment (SYBEX)", Wiley 2012.


**REFERENCES:**


1. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy", ORIELLY 2009.
2. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, "Mastering Cloud Computing: Foundations and Applications Programming", Morgan Kaufmann, 2013.


Chairperson - BoS
Dept. of CSE - VCET

**e RESOURCES**

1. http://www.cloudbus.org/cloudsim/
2. https://www.youtube.com/watch?v=441BhZwa4ZM
3. https://www.youtube.com/watch?v=xceZmVGNS_Q

**Course Outcomes:** Upon completion of this course, students will be able to:

CO1 Explain the fundamental security concepts for any given cloud application.
CO2 Discuss the strategies for a secure architecture and design of a given cloud application
CO3 Describe access control and identity management to apply for a given secure cloud application.
CO4 Explain the different design patterns to provide security for an given cloud application
CO5 Describe the different monitoring, auditing and management provisions of security to deploy for any given cloud application.

**Mapping of COs with POs and PSOs**

| Cos/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | - | 2 | 1 | 1 | - | - | - | 1 | 2 | 3 |
| CO2 | 3 | 3 | 2 | 2 | - | 2 | 1 | 1 | - | - | - | 1 | 2 | 3 |
| CO3 | 3 | 3 | 2 | 2 | - | 2 | 1 | 1 | - | - | - | 1 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 2 | - | 2 | 1 | 1 | - | - | - | 1 | 2 | 3 |
| CO5 | 3 | 3 | 2 | 2 | - | 2 | 1 | 1 | - | - | - | 1 | 2 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME65 | SOFTWARE DEFINED NETWORKS | L T P C<br>3 0 0 3 |
|---|---|---|

**Preamble:**

*The course introduces software defined networks, an emerging paradigm in computer networking that allows a logically centralized software program to control the behavior of an entire network and to deal with the ever increasing network management burden created by our interconnected world. The goal of SDN is to improve network control by enabling enterprises and service providers to respond quickly to changing business requirements.*

**UNIT 1 EVOLUTION AND GENESIS OF SDN** **9**

Basic Packet-Switching Terminology- The Modern Data Center- Traditional Switch Architecture- Autonomous and Dynamic Forwarding Tables-Evolution of Switches and Control Planes-Cost-SDN Implications for Research and Innovation-Data Center Innovation-Data Center Needs-The Evolution of Networking Technology- Forerunners of SDN - Birth of Software Defined Networking

**UNIT 2 WORKING OF SDN** **9**

Sustaining SDN Interoperability- Network Virtualization-Virtual LANs – OpenFlow VLAN Support - Fundamental Characteristics of SDN- SDN Operation-SDN Devices- SDN Controller- Alternate SDN Methods.111
1

**UNIT 3 SDN IN DATA CENTER AND OTHER ENVIRONMENTS** **9**

Data Center definition and demands- Tunneling Technologies for the Data Center- Path Technologies in the Data Center-Ethernet Fabrics in the Data Center - SDN Use Cases in the Data Center – Open SDN versus Overlays in the Data Center- Real-World Data Center- SDN in Other Environments: Wide Area Networks- ServiceProvider and Carrier Networks- Campus Networks.

**UNIT 4 PLAYERS IN SDN ECOSYSTEM** **9**

Players in the SDN Ecosystem: Academic Research Institutions - Industry Research Labs - Network Equipment Manufacturers-Software Vendors-White-Box Switches-Merchant Silicon Vendors-Original Device Manufacturers-Enterprises-Standards Bodies and Industry Alliances.

**UNIT 5 SDN APPLICATIONS** **9**

SDN Applications: Reactive versus Proactive Applications-Analyzing Simple SDN Applications-A Simple Reactive Java Application-Background on Controllers-Using the Floodlight Controller- Using the Cisco XNC Controller- Switch Considerations- Creating Network Virtualization Tunnels-Offloading Flows in the Data Center-Access Control for the Campus-Traffic Engineering for Service Providers.

**TOTAL : 45PERIODS**

**TEXT BOOKS:**


1. Paul Goransson and Chuck Black, —Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2016.
2. Thomas D. Nadeau, Ken Gray, —SDN: Software Defined Networks, O'Reilly Media, 2013, First Edition.


**REFERENCES:**


1. SiamakAzodolmolky, —Software Defined Networking with Open Flow, Packet Publishing, 2013.
2. Vivek Tiwari, —SDN and Open Flow for Beginnersǁ, Amazon Digital Services, Inc., 2013.
3. Fei Hu, Editor, —Network Innovation through Open Flow and SDN: Principles and Design, CRC Press,2014.


**e-RESOURCES:**

1. Website: Open Networking Foundation :http://opennetworking.org.
2. Website: Project Floodlight:http://www.projectfloodlight.org/floodli ght/
3. Website: OpenDaylight:https://www.opendaylight.org/
4. Website: Mininet - An Instant Virtual Network on your laptop:http://mininet.org/

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Explain the challenges and opportunities associated with adopting SDN compared to traditionalapproaches of networking.

CO2 Explain the operation of SDN to centralize network intelligence for controlling an enterprise network.

CO3 Identify the pros and cons of applying SDN in WAN and data centers.

CO4 Describe techniques to enable applications for controlling the underlying network using SDN.

CO5 Describe the use of SDN for a given networking application.

**Mapping of COs with POs and PSOs**

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

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME66 | INFORMATION SECURITY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites :**

*Preamble: Information security, sometimes shortened to InfoSec, is the practice of preventing unauthorized access, use, disclosure, disruption, modification, inspection, recording or destruction of information. The information or data may take any form, e.g. electronic or physical. Information security's primary focus is the balanced protection of the confidentiality, integrity and availability of data.*

**UNIT 1 SECURITY REQUIREMENTS AND SECURE SDLC** **9**

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.

**UNIT 2 SECURITY INVESTIGATION** **9**

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

**UNIT 3 SECURITY ANALYSIS** **9**

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem.

**UNIT 4 LOGICAL DESIGN** **9**

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.

**UNIT 5 PHYSICAL DESIGN** **9**

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.

**Total : 45 Periods**

**TEXT BOOKS:**

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Sixth Edition, Cengage Learning, 2017.
2. Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, John Wiley & Sons, 2nd edition 2017.

**REFERENCES:**

1. Micki Krause, Harold F. Tipton, — Handbook of Information Security Management, Vol 1-3 CRCPress LLC, 2012.
2. Stuart McClure, Joel Scrambray, George Kurtz, —Hacking Exposed, Tata McGrawHill, 2003
3. Matt Bishop, — Computer Security Art and Science, Pearson/PHI, 2018.

Chairperson - BoS
Dept. of CSE - VCET

**e-RESOURCES:**

1. https://nptel.ac.in/courses/106106129 , " Introduction to Information Security", Prof. V. Kamakoti, Department of Computer Science and Engineering, IIT-Madras.
2. https://nptel.ac.in/courses/106106141, " Information Security-II", Prof. V. Kamakoti , Department of Computer Science and Engineering, IIT-Madras.

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Explain security principles and components in information management using security SDLC for a business Environment.

CO2 Understand security threats and attacks and apply a security policy to overcome the threats in a given Environment.

CO3 Identify and analyze risk factors, vulnerabilities to provide a security solution for managing the risks.

CO4 Analyze security models and frameworks and use best practices and standards to develop a security policy for an organization.

CO5 Apply security technologies for informational protection in an organization.

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 | - | 2 | - | 1 | 1 | 1 | 1 | 2 | - | 2 |
| CO2 | 3 | 3 | 1 | 2 | - | 2 | - | 1 | 1 | 1 | 1 | 2 | - | 2 |
| CO3 | 3 | 3 | 2 | 2 | - | 1 | 1 | 1 | 1 | 1 | 2 | 2 | - | 2 |
| CO4 | 3 | 2 | 2 | 1 | - | 1 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 3 |
| CO5 | 3 | 2 | 2 | 2 | - | 1 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AME67 | CYBER FORENSICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites : Python**

**Preamble:** *The course cyber forensics aims to reveal electronic discovery technique used to determinethe technical and criminal evidence also involves electronic data storage extraction for legal purposes.*

**UNIT1 COMPUTER CRIME** **9**

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques – Incident and incident response methodology – Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. – Forensics Technology and Systems – Understanding Computer Investigation – Data Acquisition.

**UNIT 2 EVIDENCE COLLECTION AND FORENSICS TOOLS** **9**

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

**UNIT 3 ANALYSIS AND VALIDATION** **9**

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.

**UNIT 4 ETHICAL HACKING** **9**

Introduction to Ethical Hacking – Foot printing and Reconnaissance – Scanning Networks – Enumeration – System Hacking – Malware Threats – Sniffing.

**UNIT 5 ETHICAL HACKING IN WEB** **9**

Social Engineering – Denial of Service – Session Hijacking – Hacking Web servers – Hacking Web Applications – SQL Injection – Hacking Wireless Networks – Hacking Mobile Platforms

**Total : 45 Periods**

**TEXT BOOKS:**

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, —Computer Forensics and Investigations, Cengage Learning, India Edition, 2016.

**REFERENCES:**

1. MarjieT.Britz, —Computer Forensics and Cyber Crime: An Introduction, 3rdEdition, Prentice Hall, 2013.
2. AnkitFadia — Ethical Hacking Second Edition, Macmillan India Ltd, 2006.
3. Kenneth C.Brancik —Insider Computer Fraud Auerbach Publications Taylor & Francis Group–2019.

Chairperson - BoS
Dept. of CSE - VCET

**e-RESOURCES:**

1. http://www.cse.scu.edu/~tschwarz/COEN252_09/ln.html.

2. https://www.netacad.com/courses/security/introduction-cybersecurity.

**Course Outcomes:** Upon completion of this course, students will be able to

CO1 Indentify traditional problems associated with Computer Crime, Identity Theft & Identity Fraud using incident response methodology, – Forensic duplication and investigation

CO2 Analyze the hardware and software computer forensics tools using acquisition, validation, extraction and reconstruction-based functionalities for preserving the computer generated records from cyber attacks.

CO3 Assess the characteristics of network forensics using knoppix tool and packet sniffers for analyzing data stealing malware during the cyber attack and compare the features of E-mail, mobile device forensics using e-mail server and sim card reader investigation for mitigating the effects of phishing and identity theft.

CO4 Discover the available computer on the network using scanning and enumerating technology and escalating the privileges for cracking the system.

CO5 Elaborate the vulnerabilities that affect the web server, wireless network and mobile platforms.

**Mapping of COs with POs and PSOs**

| COsPOs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | - | - | - | 1 | - | 3 |
| **CO2** | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | - | - | - | 1 | - | 3 |
| **CO3** | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | - | - | - | 1 | - | 3 |
| **CO4** | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | - | 3 |
| **CO5** | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | - | 3 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High)

Chairperson - BoS
Dept. of CSE - VCET

# OPEN ELECTIVES

Chairperson - BoS
Dept. of CSE - VCET

| 22AMO01 | AI FOR EVERYONE | L T P C<br>3 0 0 3 |
|---|---|---|

**Preamble :**

*The course provides knowledge about what is AI, its applications and use cases and how it is transforming our lives.*

**UNIT 1 INTRODUCTION** **9**

Machine Learning, What is data, The terminology of AI, What makes an AI company, What machine learning can and cannot do, Non-technical explanation of deep learning, basics of neural networks, Examples of AI, Application domains of AI.

**UNIT 2 BUILDING AI PROJECTS** **9**

Workflow of a machine learning project, Workflow of a data science project, how to use data, How to choose an AI project, Working with an AI team, How to process and visualize data, Technical tools for AI teams, use of python in AI related projects.

**UNIT 3 BUILDING AI IN YOUR COMPANY** **9**

Example roles of an AI team, AI pitfalls to avoid, Survey of major AI application areas. Case study: Smart speaker, Self-driving car

**UNIT 4 AI AND SOCIETY** **9**

A realistic view of AI, Discrimination / Bias, Adversarial attacks on AI, Adverse uses of AI, AI and developing economies, AI and jobs.

**UNIT 5 APPLICATION OF AI** **9**

AI in Medical Imaging, Fraud Detection, Personalized Recommendations, Precision Agriculture, AI-Powered Personalized Learning, AI in Recruitment.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. https://www.coursera.org/learn/ai-for-everyone#syll
2. Artificial Intelligence: A Modern Approach, by Stuart Russell, Peter Norvig, Prentice Hall, 2010

**REFERENCES:**

1. Artificial Intelligence: The Basics by Kevin Warwick, Routledge, 2011
2. Artificial Intelligence for Humans by Jeff Heaton, Create Space Independent Publishing, 2015
3. https://www.edx.org/course/artificial-intelligence-for-everyone

**e. RESOURCES :**

1. https://nptel.ac.in/courses/106105077, "Artificial Intelligence" by Prof. AnupamBasu, Prof. S. Sarkar, IIT Kharagpur.
2. https://onlinecourses.nptel.ac.in/noc22_cs56/preview, "An Introduction to Artificial Intelligence" by Prof. Mausam, IIT Delhi.

Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Describe the basic concepts of AI and machine learning.
CO2 Explain the working of self-driving systems.
CO3 Illustrate how to build different AI projects.
CO4 Analyze the implications of AI technologies for sustainable and inclusive development.
CO5 Apply AI techniques to any application domain

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | - | 1 | 1 | 1 | - | 2 | - | - | 1 | 2 | 2 |
| **CO2** | 2 | 2 | 2 | - | 1 | 1 | 1 | - | 2 | - | - | 1 | 2 | 2 |
| **CO3** | 2 | 2 | 2 | - | 1 | 1 | 1 | - | 2 | - | - | 1 | 2 | 2 |
| **CO4** | 2 | 2 | 2 | - | 1 | 1 | 1 | - | 2 | - | - | 1 | 2 | 2 |
| **CO5** | 2 | 2 | 2 | - | 1 | 1 | 1 | - | 2 | - | - | 1 | 2 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMO02 | MACHINE LEARNING AND ITS APPLICATIONS | L T P C<br>3 0 0 3 |
|---|---|---|

**Preamble :**

*The course provides knowledge about various concepts and algorithms in machine learning and formulates solutions to different applications and real world problems.*

**UNIT 1 INTRODUCTION TO MACHINELEARNING** **9**

Machine learning– Need of machine learning– Types of Machine Learning algorithms – Machine Learning Process – Data Collection, Exploration, Preparation, Training, Optimization– Applications of Machine Learning

**UNIT 2 SUPERVISEDLEARNING -I** **9**

Supervised Machine Learning – Types of supervised machine learning algorithms – Classification algorithms– Support VectorMachine–KNN–Naïvebayesclassifiers–DecisionTree. Application of ML– Email Spam filtering – FraudDetection–Recommendation systems

**UNIT 3 SUPERVISEDLEARNING -II** **9**

Introduction to RegressionTechniques–Linearregression–PolynomialRegression,LogisticRegression. Application of ML-House price prediction , StockPrediction.

**UNIT 4 UNSUPERVISEDLEARNING-I** **9**

Unsupervised Machine Learning – Clustering–K-MeansClustering – Density-based Clustering – Distribution-based Clustering – Hierarchical Clustering – Application of ML-Customer segmentation .

**UNIT 5 UNSUPERVISEDLEARNING-I I** **9**

Association –Apriori algorithm – Dimensionality Reduction – Principal Component Analysis – Application of ML-Market Basket Analysis – Financial Data Analysis.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Muller, Andreas C., and Sarah Guido. Introduction to machine learning with Python: a guide for data scientists. Third edition, "O'Reilly Media, Inc.", 2016.
2. Geron, Aurelien. Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow: Concepts, tools, and techniques to build intelligent systems. First edition, O'Reilly Media, 2019.


**REFERENCES:**


1. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Funny Systems with Python: With Case Studies and Applications from the Industry, third edition,2019.
2. Leonardo De Marchi, Hands-On Neural Networks: Learn how to Build and Train Your First Neural Network Model Using Python Book, First edition,2019.
3. James Loy, Neural Network Projects with Python: The ultimate guide to using Python to explore the true power of neural networks through six projects First edition, Kindle Edition,2019.


Chairperson - BoS
Dept. of CSE - VCET

**e. RESOURCES :**

1. https://nptel.ac.in/courses/106106139
2. https://onlinecourses.nptel.ac.in/noc23_ee87/preview

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Describe the fundamental concepts of machine learning.
CO2 Illustrate the classification algorithms and its applications
CO3 Examinetheconcepts of regression and its applications.
CO4 Illustrate the features of clustering algorithms
CO5 Describe the association and dimensionality reduction concepts.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | - | 1 | - | - | - | 2 | - | - | 1 | - | - |
| **CO2** | 2 | 2 | 2 | - | 1 | - | - | - | 2 | - | - | 1 | - | - |
| **CO3** | 2 | 2 | 2 | - | 1 | - | - | - | 2 | - | - | 1 | - | - |
| **CO4** | 2 | 2 | 2 | - | 1 | - | - | - | 2 | - | - | 1 | - | - |
| **CO5** | 2 | 2 | 2 | - | 1 | - | - | - | 2 | - | - | 1 | - | - |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMO03 | DESIGN THINKING | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites :**

**Preamble :**

*To understand the principles of Design Thinking, a creative solution-based approach to problem solving. Agile methodology as a practice to promote continuous iteration of development and testing throughout SDLC. the basics about development cycles, IT Operations & faster innovation. DevOPs the advanced process of software engineering for faster problem resolution & team collaboration.*

**UNIT 1 INTRODUCTION TO DESIGN THINKING** **9**

Introduction to Design Thinking – Importance of Design Thinking – History of Design Thinking- Design Thinking Framework - Design Thinking Methods - Empathise –Define – Ideate – Prototype – Test- Software Development Methodology – Waterfall model – V –model -Customer Example.

**UNIT 2 INTRODUCTION TO AGILE** **9**

History of Agile – Agile principles – Agile Vs Waterfall – Agile Methodology Overview- Agile frameworks – Extreme programming - Rational Unified Process (RUP) - Test Driven Development (TDD) – Feature Drive Development (FDD)- Scrum - Kanban Methodology – Agile and Devops.

**UNIT 3 AGILE SOFTWARE DEVELOPMENT** **9**

Software Development- using Extreme Programming – Roles & Rules - Software Development using Scrum Framework – Scrum team – Sprints – Sprints planning – Metrics – Scrum tools - Case Studies.

**UNIT 4 DESIGN THINKING FOR STRATEGIC INNOVATION** **9**

Innovation Management-Changing Management Paradigms-Design Thinking related to Science and art-Design Thinking in Business-Linking Design Thinking Solution to Business Challenges

**UNIT 5 DEVOPS** **9**

Introduction to DevOps – DevOpsvs Agile – DevOps Principles and Life Cycle – Introduction to CI / CD &DevOps Tools– Version Control – Build Automation – Configuration Management – Containerization – Continuous Deployment – Continuous Integration – Continuous Testing –Continuous Monitoring.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. MaurícioVianna, YsmarVianna, Brenda Lucena and Beatriz Russo," Design thinking : Business innovation", MJV Technologies and innovation press, 2011
2. Design Thinking: Integrating Innovation, Customer Experience, and Brand Valueby Thomas Lockwood (Editor) Published February 16th 2010 by Allworth Press.

**REFERENCES:**


1. KalloriVikram, —Introduction to DevOps, 1 st Edition, KalloriVikram Publication, 2016.
2. Jaokim Verona, —Practical DevOps, 2 nd Edition, Packt. Publication, 2018.
3. Stephen Fleming, Pravin, —DevOps Handbook: Introduction of DevOps Resource Management-1 Edition, Createspace Independent Pub. , 2010.
4. Len Bass, Ingo Weber, Liming Zhu, G., —DevOps: A Software Architect's Perspective, 1st Edition, Addison Wesley Professional, 2015
5. Alistair Cockburn, "Agile Software Development", 2nd ed, Pearson Education, 2007.




Chairperson - BoS
Dept. of CSE - VCET

**e. RESOURCES :**

1. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCSA1306.pdf

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Apply design thinking concepts to give solution for the problems identified
CO2 Implement Agile software methodology for faster development of quality software
CO3 Describe how to improve collaboration between development and operations.
CO4 Design innovative products
CO5 Implement Automated Installations and Deployments

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 1 | 1 | 1 |
| CO2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 1 | 1 | 1 |
| CO3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 1 | 1 | 1 |
| CO4 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 1 | 1 | 1 |
| CO5 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 1 | 1 | 1 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

| 22AMO04 | NEURAL NETWORKS | L T P C<br>3 0 0 3 |
|---|---|---|

**Pre-requisites:-**

**Preamble**

*This course is designed to provide the knowledge about neural networks and artificial neural networks. It gives explanation about the basics of RBF, different types of neural networks and self –organization feature maps with applications.*

**UNIT1 INTRODUCTION** **9**

Neural Networks - Application Scope of Neural Networks - Artificial Neural Network: An Introduction- Evolution of Neural Networks - Basic Models of Artificial Neural Network - Important Terminologies of ANNs

**UNIT2 RADIAL-BASIS FUNCTION NETWORKS** **9**

Radial Basis Function- Regularization theory- Generalized RBF Networks- Learning in RBFNs-RBF application to face recognition

**UNIT3 SUPERVISED LEARNING NETWORK** **9**

Supervised Learning Networks-Perceptron Networks-Adaptive Linear Neuron-Back-propagation Network

**UNIT4 ASSOCIATIVE MEMORY** **9**

Associative Memory Networks - Training Algorithms for pattern association - BAM and Hopfield Networks

**UNIT5 UNSUPERVISED LEARNING NETWORK** **9**

Unsupervised Learning Network- Introduction-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps- Learning Vector Quantization Counter- propagation Networks-Adaptive Resonance Theory Network

**Total : 45 Periods**

**TEXT BOOKS:**


1. "Neural Networks A Classroom Approach" -Satish Kumar, Mc Graw Hill Education (India) Pvt. Ltd, Second Edition. 2012
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.
3. S Rajasekaran, G A VijayalakshmiPai, "Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications", PHI Learning, 2017


**REFERENCES:**


1. Introduction to Artificial Neural Systems - J.M. Zurada, Jaico Publications 1994.
2. Artificial Neural Networks- B. Yegnanarayana, Pill, New Delhi 1998.


**e. RESOURCES :**

1. https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteenchallenges-and-opportunities/
2. https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence



Chairperson - BoS
Dept. of CSE - VCET

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Ability to understand the concepts of Neural Networks.

CO2 Apply RBF and its variants for suitable applications

CO3 Ability to use the various types of Artificial Neural Networks.

CO4 Describe the basics of associative memory algorithms.

CO5 Illustrate the Unsupervised Learning Network with the suitable examples.

**Mapping of COs with POs and PSOs**

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 1 | 1 |
| CO2 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 1 | 1 |
| CO3 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 1 | 1 |
| CO4 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 1 | 1 |
| CO5 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 1 | 1 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

Chairperson - BoS
Dept. of CSE - VCET

22AMO05 **DIGITAL MARKETING** L T P C 3 0 0 3

**Preamble :**

*The primary objective of this module is to examine and explore the role and importance of digital marketing in today's rapidly changing business environment. It also focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.*

**UNIT 1 INTRODUCTION TO ONLINE MARKET** 9

Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.

**UNIT 2 SEARCH ENGINE OPTIMISATION** 9

Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement.

**UNIT 3 E-MAIL MARKETING** 9

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing-Mobile Inventory/channels Location based; Context based; Coupon sand offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting.

**UNIT 4 SOCIAL MEDIA MARKETING** 9

Social Media Marketing-Social Media Channels-Leveraging Social media for brand conversations and buzz. Successful / benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.

**UNIT 5 DIGITAL TRANSFORMATION** 9

Digital Transformation & Channel Attribution-Analytics-Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1 Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education; First edition ( July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373.

2 Digital Marketing by VandanaAhuja ; Publisher: Oxford University Press ( April 2015). ISBN-0199455449


**REFERENCES:**


1 Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938; ISBN 13: 9788126566938; ASIN: 8126566930.

2 Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.

3 Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western, Cengage Learning.

4 Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education.


Chairperson - BoS
Dept. of CSE - VCET

**e. RESOURCES :**

1. https://onlinecourses.swayam2.ac.in/ugc19_hs26/preview, "Digital Marketing", by Dr.Tejinderpal Singh, Panjab University, Chandigarh
2. https://onlinecourses.nptel.ac.in/noc22_mg109/preview, "Introduction to Marketing Essentials", by Prof. ZillurRahman, IIT Roorkee

**Course Outcomes:** Upon completion of the course, students will be able to:

CO1 Evaluate the role and significance of digital marketing in the dynamic landscape of contemporary business environments.
CO2 Analyze how digital marketing can be utilized by organizations and evaluate its effectiveness.
CO3 Explain the key elements of a digital marketing strategy.
CO4 Assess and measure the effectiveness of a digital marketing campaign
CO5 Apply advanced practical skills in utilizing common digital marketing tools including SEO, SEM, Social media, and Blogs

| COs/POs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | 1 | 3 | - | - | - | 1 | 2 | 3 | 3 | 3 | 3 |
| **CO 2** | 2 | 2 | 2 | 1 | 3 | - | - | - | 1 | 2 | 3 | 3 | 3 | 3 |
| **CO 3** | 1 | 1 | 1 | 2 | 2 | - | - | - | 1 | 2 | 1 | 1 | 3 | 2 |
| **CO 4** | 3 | 2 | 2 | 3 | 1 | - | - | - | 1 | 3 | 2 | 3 | 2 | 3 |
| **CO 5** | 2 | 3 | 1 | 3 | 3 | - | - | - | 2 | 3 | 1 | 2 | 1 | 2 |

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).



Chairperson - BoS
Dept. of CSE - VCET

# VALUE ADDED COURSES



Chairperson - BoS
Dept. of CSE - VCET

| 22CSV01 | R PROGRAMMING | L T P C<br>0 0 2 1 |
|---|---|---|

**Pre-requisites :-**Knowledge of basic statistics (t-test, chi-square-test, regression) and know the difference between descriptive and inferential statistics.

**Preamble :**

*The goal of R programming is to emphasize on the understanding of how R works, with the aim of a beginner, rather than expert, use. R is a system for statistical analyses and graphics. R is both software and a language considered as a dialect of the S language created by the AT&T Bell Laboratories. R is freely distributed under the terms of the GNU General Public License; its development and distribution are carried out by several statisticians known as the R Development Core Team.*

**MODULE 1 OVERVIEW OF R LANGUAGE** **10**

- Defining the R project
- Generating R codes, Scripts
- Text editors for R
- Graphical User Interfaces (GUIs) for R, Packages.

**MODULE 2 R OBJECTS AND EXPLORATORY DATA ANALYSIS** **20**

- R Objects and data structures: Variable classes, Vectors and matrices, Data frames and lists.
- Manipulating objects in R: Mathematical operations, Decision making, loops, functions and Strings.
- Exploratory Data Analysis: Reading, creating and storing R -CSV file, Excel File.
- Graphical Representation: R-PIE chart – Bar chart – line graphs.

**TOTAL: 30 PERIODS**

**REFERENCES:**


1. Jared P. Lander, "R for everyone", Pearson Education, 2nd Edition,2015
2. Norman Matloff, "The Art of R Programming", No Starch Press, 2011.


**c. RESOURCES :**

1. https://www.udemy.com/course/r-basics/
2. https://www.coursera.org/learn/r-programming/

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Understand the basics of R programming and able to develop R script using GUI.

**CO2** Understand the depth of exploratory data analysis and able to represent the data in charts and graphs.

| 22CSV02 | NETWORK ESSENTIALS | L T P C<br>0 0 2 1 |
|---|---|---|

**Pre-requisites:-** *Nil*

**Preamble :**

*The course aims to provide an understanding of computer networks architecture, various technologies available to build a network and protocols in use at different levels of network layers stack. An overview of global Internet, Internet applications and types of protocols used for mail transfer is also provided.*

**MODULE 1 INTRODUCTION TO COMPUTER NETWORKS** **10**

- Introduction to Computer networks
- Layers in OSI models
- Topologies
- Addressing
- Functions and protocols of layers of networks

**MODULE 2 WORKING WITH NS2 AND CISCO PACKET TRACER** **20**

- Study of Network simulator 2 (NS2)
- Implementation of Various Topologies using NS2 Simulator.
- Case Study using Cisco Packet Tracer
- Establish a LAN in Cisco Packet Tracer and perform traffic analysis for FTP using TrafficGenerator

**TOTAL: 30 PERIODS**

**REFERENCES:**


1. Behrouz A. Forouzan, "Data Communications and Networking", Fifth Edition, Tata McGraw - Hill, Reprint 2017.
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.


**e. RESOURCES :**

1. http://www.nptel.ac.in/downloads/106105080, "Computer Networks", Prof.Sujoy Ghosh, IIT Kharagpur.

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Interpret the importance of layering, addressing and annotate the protocol stack of OSI model

**CO2** Simulate the network topologies using NS2 for data communication and create LAN using CISCO Packet tracer.



Chairperson - BoS
Dept. of CSE - VCET

| 22CSV03 | TYPE SCRIPT | L T P C<br>0 0 2 1 |
|---|---|---|

**Pre-requisites :**Knowledge of Object Oriented Programming Concepts, Java Script

**Preamble :**

*Type Script is an open-source pure object-oriented programming language developed and maintained by Microsoft under the Apache 2 license. TypeScript extends JavaScript by adding data types, classes, and other object-oriented features with type-checking. It is a typed superset of JavaScript that compiles to plain Java Script. This course aims to impart knowledge about the implementation of TypeScript among the student community.*

**MODULE 1 INTRODUCTION TO TYPESCRIPT** **10**

Getting to Know TypeScript - Typescript's Type System – Components - Setup the Environment - Basic Data Types -Type Inference -Type Casting -Difference between let and var -Const Declaration-Arrow Function.

**MODULE 2 IMPLEMENTATION OF TYPESCRIPT** **20**

Classes-Type casting- Type Assertion -Static Properties-Interface Implementation by class-Array Destructuring -Object Destructuring -Mixed Destructuring-Generic Classes-Modules.

**TOTAL: 30 PERIODS**

**REFERENCES:**


1. Dan Vanderkam , "Effective TypeScript" - O'Reilly Media; 1st edition, 2019.
2. Remo H. Jansen , "Learning TypeScript" - Packt Publishing; 1st edition 2015.


**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Know about typescript and benefits of typescript over other scripting languages

**CO2** Create generics with typescript



Chairperson - BoS
Dept. of CSE - VCET

| 22CSV04 | REST API | L T P C<br>0 0 2 1 |
|---|---|---|

**Pre-requisites :** Knowledge of Java

**Preamble :**

*This course will help you to understand the concepts of REST API ,its benefits, principles and design of API*

**MODULE 1 OVERVIEW OF RESTAPI** **10**

- Understanding and Using REST API
- Benefits of REST API
- Evolution of REST API
- API Endpoint

**MODULE 2 DESIGNING REST API** **20**

- Implementing REST API
- Implementing REST API CRUD operations
- REST API error handling operations
- REST API Security

**TOTAL: 30 PERIODS**

**REFERENCES:**


1. https://blog.hubspot.com/website/what-is-rest-api
2. https://www.geeksforgeeks.org/rest-api-introduction/


**e. RESOURCES :**

1. https://www.ramotion.com/blog/rest-api/
2. https://www.edx.org/learn/rest-api

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Understand the basic concepts of REST API.

**CO2** Build a fully functional REST API.



Chairperson - BoS
Dept. of CSE - VCET

| 22CSV05 | PROMPT ENGINEERING | L T P C<br>0 0 2 1 |
|---|---|---|

**Pre-requisites : AI, NLP**

**Preamble :**

*Primary aim of the course is to introduce learners with essentials of prompt engineering. Prompt engineering is a concept in artificial intelligence, particularly natural language processing. In prompt engineering, the description of the task that the AI is supposed to accomplish is embedded in the input, the essentials cover techniques and applications and challenges of prompt engineering core algorithms for solving basic tasks with ChatGPT.*

**MODULE 1 INTRODUCTION TO PROMPT ENGINEERING** **10**

- Define Prompt Engineering
- Importance of prompt engineering
- Types of Prompts
- Basic Principles of Prompt Engineering

**MODULE 2 GENERATING PROMPTS** **20**

- Pattern Matching and Template-Based Prompt Generation
- Metrics for Evaluating Prompts
- Creating a Perfect Prompt with ChatGPT
- Challenges & Best Practices

**TOTAL: 30 PERIODS**

**REFERENCES:**


1. Ryan Turner ChatGPT & Social Media Marketing: The Ultimate Guide to Succeeding on Social Media. Discoverhow Artificial Intelligence can make you the world's best Social Media Manager , Independently published, 2023.
2. Bruce Brown ,ChatGPT Prompt Engineering: PROMPTS (ver. 3a) , 2022


**e. RESOURCES :**

1. https://www.udemy.com/course/chatgpt-prompt-engineering-for-beginners/
2. https://www.theknowledgeacademy.com/in/courses/artificial-intelligence-tools-training/chatgpt-prompt- engineering-training/

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Understand the basic principles of prompt engineering

**CO2** Use tools to creating a perfect prompt with chatGPT



Chairperson - BoS
Dept. of CSE - VCET

| 22CSV06 | POWER BI | L T P C<br>0 0 2 1 |
|---|---|---|

**Pre-requisites:-** Knowledge on Computer Programming, Microsoft Excel, Tables, Data modeling and have little knowledge of DAX (Data Analysis expressions) language.

**Preamble :**

*Microsoft Power BI is a business intelligence and analytics platform consisting of applications and services designed to provide coherent visual and interactive insights into data. This course covers the installation and configuration of the primary tools and services that BI professionals utilize to design and develop Power BI content, including Power BI Desktop, the On-Premises Data Gateway and the Power BI Publisher for Excel.*

**MODULE 1 FUNDAMENTALS OF POWER BI** **10**

- Power BI architecture and Data Access.
- Power BI Desktop installation.
- Integrating Power BI and Data Source.
- Creating Visuals for Excel Tables

**MODULE 2 IMPLEMENTATION, PUBLISHING AND SHARING OF POWER BI DESKTOP VISUALIZATION** **20**

- Hands-on with Creating Visualizations in Power BI
- DAX concept
- Embedding business definitions to DAX Measures
- Creating Power BI Dashboard
- Setting up scheduled refreshes and security
- Publishing Power BI report

**TOTAL: 30 PERIODS**

**REFERENCES:**


1. Brett Powell "Microsoft Power BI Cookbook: Creating Business Intelligence Solutions of Analytical Data Models, Reports, and Dashboard", Packt Publishing, 2017
2. Philip Seamark "Beginning DAX with Power BI: The SQL Pro's Guide to Better Business Intelligence", Apress Publishing, 2018


**e. RESOURCES :**

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013094430259552256232 3_shared/ overview
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013094416968196096202 2_shared/ overview
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013094435437903872254 6_shared/ overview

**Course Outcomes:** Upon completion of the course, students will be able to:

**CO1** Design a Power BI dashboard for a given business model and publish the reports in dashboard.



Chairperson - BoS
Dept. of CSE - VCET