# KUMARAGURU COLLEGE OF TECHNOLOGY,

An autonomous Institution affiliated to Anna University, Chennai

## COIMBATORE – 641 049.

# B.E. COMPUTER SCIENCE AND ENGINEERING

## REGULATION 2024



## I to IV Semesters (2025 Batch)

## Department of Computer Science and Engineering

## VISION

To evolve as a School of Computer Science with centers of excellence having international reputation to serve the changing needs of Indian industry and society.

## MISSION

- Computer Science and Engineering department is committed to bring out career oriented graduates who are industry ready through innovative practices of teaching-learning process.

- To cultivate professional approach, strong ethical values and team spirit along with leadership qualities among the graduates by organizing workshops, seminars and conferences periodically. Association with professional bodies and invitation to external experts should help this.

- To contribute towards techno-economic and social development of the nation through quality human resource and encouraging entrepreneurship among the young graduates.

## PROGRAM SPECIFIC OUTCOMES (PSOs)

The Program Specific Outcomes of Computer Science and Engineering Undergraduate Program are:

### PSO 1: Proficiency in Software Engineering and System Design

Graduates will be able to design, develop, and optimize software solutions, applying core principles of computer science to build efficient, scalable, and secure systems

### PSO 2: Competency in Emerging Technologies

Graduates will develop expertise in emerging technologies and specialized domains enabling them to Innovate and build advanced solutions meeting Industrial and societal needs.

## PROGRAM OUTCOMES (POs)

Graduates of the Computer Science and Engineering Undergraduate Program should have the ability to:

**PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.

**PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

**PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

**PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

**PO5: Engineering Tool Usage:** Create, select, and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

**PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture, and environment.

**PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

**PO8: Individual and Collaborative Teamwork:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

**PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

**PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

**PO11: Life-Long Learning:** Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

# KUMARAGURU COLLEGE OF TECHNOLOGY
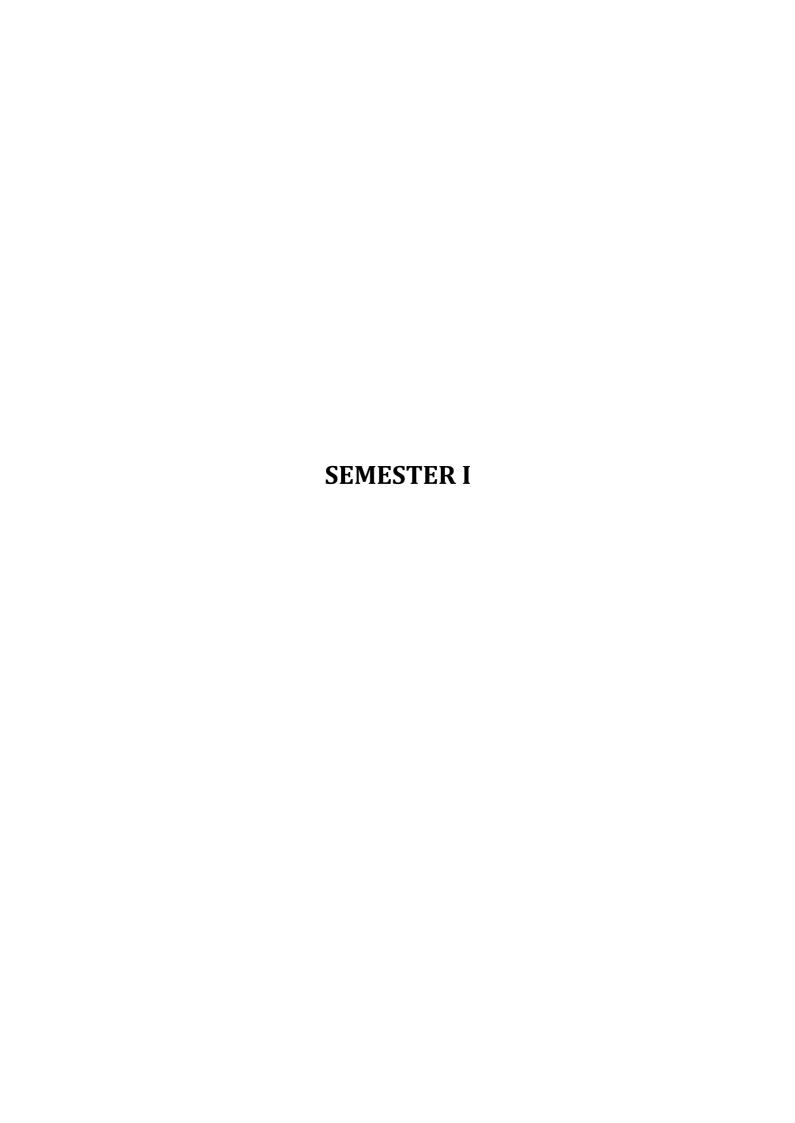## COMPUTER SCIENCE AND ENGIEERING
## REGULATION 2024
## B.E. Computer Science and Engineering – Curriculum

## 2025 Batch Structure

### Semester I

| S.No | Course code | Course Title | Course Mode | Course Type | L | T | P | J | C |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 24HST103 / 24HST104 | Effective Communication / Professional Communication | Theory | HS | 2 | 0 | 0 | 0 | 2 |
| 2 | 24MAI114 | Applied Linear Algebra and Calculus | Embedded | BS | 3 | 0 | 2 | 0 | 4 |
| 3 | 24PHI101 | Applied Physics for Computing | Embedded | BS | 3 | 0 | 2 | 0 | 4 |
| 4 | 24CSI006 | Programming in C | Embedded | ES | 3 | 0 | 2 | 0 | 4 |
| 5 | 24CSI102 | Digital Logic Circuits | Embedded | ES | 2 | 0 | 2 | 0 | 3 |
| 6 | 24HST101 | Heritage of Tamils | Theory | HS | 1 | 0 | 0 | 0 | 1 |
| 7 | 24INP102 | Innovation Practicum - 1 | Practical | ES | 0 | 0 | 2 | 0 | 1 |
| 8 | 24HSP111 | Holistic Wellness - 1 | Practical | HS | 0 | 0 | 2 | 0 | 1 |
| 9 | 24INO101 | FCLF- General Stack-1 | Practical | OE | 0 | 0 | 2 | 0 | 1 |
| 10 | 24CSV001 | Emerging Domains | Embedded | Value addition | 2 | 0 | 0 | 0 | 0 |
| | | | | | | | | **Total Credits** | 21 |
| | | | | | | | | **Total Contact Hours/week** | 31 |

### Semester II

| S.No | Course code | Course Title | Course Mode | Course Type | L | T | P | J | C |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 24HSP005 | Mastering Conversations | Practical | HS | 0 | 0 | 2 | 0 | 1 |
| 2 | 24MAI124 | Multivariate Calculus and Forecasting | Embedded | BS | 3 | 0 | 2 | 0 | 4 |
| 3 | 24CSI007 | Python Programming | Embedded | ES | 2 | 0 | 2 | 0 | 3 |
| 4 | 24ITI001 | Embedded Systems | Embedded | ES | 2 | 0 | 2 | 0 | 3 |
| 5 | 24ADT015 | Finance, Economics and Marketing | Theory | HS | 3 | 0 | 0 | 0 | 3 |
| 6 | 24HST102 | Tamils and Technology | Theory | HS | 1 | 0 | 0 | 0 | 1 |
| 7 | 24INP103 | Innovation Practicum- 2 | Practical | ES | 0 | 0 | 2 | 0 | 1 |
| 8 | 24HSP112 | Holistic Wellness-2 | Practical | HS | 0 | 0 | 2 | 0 | 1 |
| 9 | 24INO102 | FCLF- General Stack-2 | Practical | OE | 0 | 0 | 2 | 0 | 1 |
| 10 | 24INP101 | Design Thinking | Practical | HS | 0 | 0 | 2 | 0 | 1 |
| 11 | 24CSV002 | Disruptive Technologies | Embedded | Value addition | 2 | 0 | 0 | 0 | 0 |
| | | | | | | | | **Total Credits** | 19 |
| | | | | | | | | **Total Contact Hours/week** | 30 |

| | | Semester III | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S.No | Course code | Course Title | Course Mode | Course Type | L | T | P | J | C |
| 1 | 24MAI234 | Computational Probability and Statistics | Embedded | BS | 3 | 0 | 2 | 0 | 4 |
| 2 | 24CSI104 | Data Structures and Algorithms | Embedded | ES | 3 | 0 | 2 | 0 | 4 |
| 3 | 24CSI008 | Object Oriented Programming | Embedded | ES | 3 | 0 | 2 | 0 | 4 |
| 4 | 24CSI009 | Database Management Systems | Embedded | PC | 3 | 0 | 2 | 0 | 4 |
| 5 | 24ADI001 | Artificial Intelligence and Automation | Embedded | PC | 3 | 0 | 2 | 0 | 4 |
| 6 | 24INP201 | Innovation Practicum- 3 | Practical | ES | 0 | 0 | 2 | 0 | 1 |
| 7 | 24HSP006 | Mastering Group Discussion and Presentation Skills | Practical | HS | 0 | 0 | 2 | 0 | 1 |
| 8 | 24INOXYY | FCLF- General Stack-3 | Practical | OE | 0 | 0 | 2 | 0 | 1 |
| 9 | 24CSJ210 | Social Internship | Project | PRJ | 0 | 0 | 0 | 2 | 1 |
| 10 | 24ITT012 | Aptitude and Reasoning – I | Theory | HS | 0 | 1 | 0 | 0 | 1 |
| | | | | | | | Total Credits | | 25 |
| | | | | | | | Total Contact Hours/week | | 31 |

| | | Semester IV | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S.No | Course code | Course Title | Course Mode | Course Type | L | T | P | J | C |
| 1 | 24MAT243 | Discrete Mathematics and Optimization | Theory | BS | 3 | 0 | 0 | 0 | 3 |
| 2 | 24ITT203 | Computer Organization and Architecture | Theory | PC | 3 | 0 | 0 | 0 | 3 |
| 3 | 24CSI011 | Computer Networks and Security | Embedded | PC | 3 | 0 | 2 | 0 | 4 |
| 4 | 24CSP012 | Java Programming | Practical | PC | 0 | 0 | 4 | 0 | 2 |
| 5 | 24CSI213 | Cloud Computing | Embedded | PC | 3 | 0 | 2 | 0 | 4 |
| 6 | 24ADI003 | Machine Learning | Embedded | PC | 3 | 0 | 2 | 0 | 4 |
| 7 | 24INM202 | Environmental Science and Sustainability | Embedded | HS | 1 | 0 | 2 | 0 | 2 |
| 8 | 24HSP007 | Building Professional Readiness | Practical | HS | 0 | 0 | 2 | 0 | 1 |
| 9 | 24INP202 | Innovation Practicum - IV | Practical | ES | 0 | 0 | 2 | 0 | 1 |
| 10 | 24ITT013 | Aptitude and Reasoning - II | Theory | HS | 0 | 1 | 0 | 0 | 1 |
| | | | | | | | Total Credits | | 25 |
| | | | | | | | Total Contact Hours/week | | 32 |

| | | Semester V | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S.No | Course code | Course Title | Course Mode | Course Type | L | T | P | J | C |
| 1 | 24CSI014 | Design and Analysis of Algorithms | Embedded | PC | 3 | 0 | 2 | 0 | 4 |
| 2 | 24CSI015 | Full Stack Web Development | Embedded | PC | 3 | 0 | 2 | 0 | 4 |
| 3 | 24ITI305 | Operating Systems | Embedded | PC | 3 | 0 | 2 | 0 | 4 |
| 4 | 24CST316 | Foundations of Blockchain Technology | Theory | PC | 3 | 0 | 0 | 0 | 3 |

| S.No | Course code | Course Title | Course Mode | Course Type | L | T | P | J | C |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 24------ | Professional Elective I | Embedded/Theory | PE | * | 0 | * | * | 3 |
| 6 | 24------ | Professional Elective II | Embedded/Theory | PE | * | 0 | * | * | 3 |
| 8 | 24INM201 | Universal Human Values-II | Theory | HS | 1 | 0 | 0 | 0 | 1 |
| 9 | 24CSJ317 | Technical Internship | Project | PRJ | 0 | 0 | 0 | 4 | 2 |
| | | | | | | | Total Credits | | 24 |
| | | | | | | | Total Contact Hours/week | | 26* |

## Semester VI

| S.No | Course code | Course Title | Course Mode | Course Type | L | T | P | J | C |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 24CST318 | Formal Languages and Compiler Design | Theory | PC | 3 | 0 | 0 | 0 | 3 |
| 2 | 24ADI319 | Big Data Analytics | Embedded | PC | 3 | 0 | 2 | 0 | 4 |
| 3 | 24CSI020 | Agile Software Development | Embedded | PC | 2 | 0 | 0 | 2 | 3 |
| 4 | 24------ | Professional Elective III | Embedded/Theory | PE | * | 0 | * | * | 3 |
| 5 | 24------ | Professional Elective IV | Embedded/Theory | PE | * | 0 | * | * | 3 |
| 6 | 24------ | Professional Elective V | Embedded/Theory | PE | * | 0 | * | * | 3 |
| 7 | 24CSOXYY | OE2/ GE2 | Theory | OE | 3 | 0 | 0 | 0 | 3 |
| 8 | 24HSTXYY | Foreign Language | Theory | HS | 2 | 0 | 0 | 0 | 2 |
| 9 | 24INMXYY | Constitution of India | Theory | HS | 2 | 0 | 0 | 0 | 0 |
| | | | | | | | Total Credits | | 24 |
| | | | | | | | Total Contact Hours/week | | 28* |

## Semester VII

| S.No | Course code | Course Title | Course Mode | Course Type | L | T | P | J | C |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 24------ | Professional Elective VI | Embedded/Theory | PE | * | 0 | * | * | 3 |
| 2 | 24CSOXYY | OE3/GE3 | Theory | OE | 3 | 0 | 0 | 0 | 3 |
| 3 | 24INM102 | Indian Knowledge System in Science and Engineering | Theory | HS | 1 | 0 | 0 | 0 | 1 |
| 4 | 24CSJ421 | Project Phase-I | Project | PRJ | 0 | 0 | 0 | 14 | 3 |
| 5 | 24CSJ422 | Professional Internship | Project | PRJ | 0 | 0 | 0 | 4 | 0 |
| | | | | | | | Total Credits | | 10 |
| | | | | | | | Total Contact Hours/week | | 13* |

## Semester VIII

| S.No | Course code | Course Title | Course Mode | Course Type | L | T | P | J | C |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 24CSJ423 | Project Phase-II | Project | PRJ | 0 | 0 | 0 | 24 | 12 |
| | | | | | | | Total Credits | | 12 |
| | | | | | | | Total Contact Hours/week | | 24 |
| | | | | | | | Grand Total Credits | | 160 |

# SEMESTER I

| 24HST103 | EFFECTIVE COMMUNICATION | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 0 | 2 |
| HS | | SDG | | | 4, 8 | |

| Pre-requisite courses | - | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to

| 1 | enhance students' abilities to communicate ideas effectively, both orally and in writing, by developing skills in organizing thoughts clearly and logically and expressing them through well-structured paragraphs and concise summaries. |
|---|---|
| 2 | enable students to critically evaluate and synthesize information from multiple sources and utilize suitable writing techniques and formats to produce professional-quality content tailored to various contexts. |
| 3 | foster active listening, critical reading, and reflective thinking, empowering students to create engaging, relevant, and informative content by applying effective communication strategies across diverse platforms. |

## Course Outcomes

| After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|
| CO1 | demonstrate proficiency in delivering ideas effectively, both in speaking and writing, with a deeper understanding of the content and the ability to convey complex ideas through well-structured paragraphs and summaries. | Ap |
| CO2 | create and present original content by evaluating information from multiple sources and employing appropriate formats and writing strategies across various professional contexts. | C |
| CO3 | produce engaging and informative content through active listening, reading, reflection, and effective communication skills. | E |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | | | | | | | 2 | 2 | 3 | | 3 | | |
| 2 | | | | | | | 2 | 2 | 3 | | 3 | | |
| 3 | | | | | | | 2 | 2 | 3 | | 3 | | |

| *Course Content* | |
|---|---|
| **Text Analysis**<br>Composition of Coherent Paragraphs (Expository, Descriptive, Narrative, Evaluative) - Loud Reading (Reading Extracts will be given were students identify the main idea of paragraphs or sections and debrief) | **6 Hours** |
| **Visual & Written Analysis**<br>Process writing (Drafting effective introduction, process and conclusion using appropriate transition words and phrases) - Describing Visuals (Line graph, Bar Chart, Flow Chart, Pie Chart, Table, Tree diagram) - Note Making & Summarizing | **6 Hours** |
| **Professional Correspondence**<br>Crafting Professional Emails - Writing Instruction for Manuals – Reading technical documents (Reading extracts will be given to construct sentences from the new words found in the document) | **6 Hours** |
| **Research and Documentation**<br>Library Reading (Identify at least three sources and extract information, Summarize the main ideas and key findings from each source, compile them findings into a brief report that includes the main points, sources, and relevance to the topic)- Report Writing (Title Page, Abstract, Introduction, Methodology, Results, Discussion, Conclusion and recommendation) | **6 Hours** |
| **Talk Analysis and Podcast Skills**<br>Listening to and analyzing TED talks – Preparing Podcast-PRISM (Professional Rhetoric Improvement and Speech Mastery) to share facts, opinions and experiences - Writing Reviews on products. | **6 Hours** |

| Theory<br>Hours: 30 | Tutorial<br>Hours: 0 | Practical<br>Hours: 0 | Project<br>Hours: 0 | Total<br>Hours: 30 |
|---|---|---|---|---|

| **Learning Resources** |
|---|

**References:**

1. Swamy, V. R. Narayana. Strengthen Your Writing. Orient Longman, 2003.
2. Sasikumar, V., and P. V. Dhamija. Spoken English: A Self-Learning Guide to Conversation Practice. Tata McGraw Hill, New Delhi (1993).
3. Maison, Margaret M. Examine Your English. Orient Longman, 1999.
4. Rizwi, Ashraf. Effective Technical Communication. Tata McGraw Hill, 2005.
5. Pickett, Nell Ann, and Ann A. Laster. Technical English: Writing, Reading, and Speaking.
6. Harpercollins College Div, 1993.

**Online Resources (Weblinks)**

1. https://owl.purdue.edu/owl/general_writing/academic_writing/paragraphs_and_paragraphing/index.html
2. https://learnenglish.britishcouncil.org/skills/writing/upper-intermediate b2/describing-trends
3. https://hbr.org/2016/07/how-to-write-email-with-military-precision
4. https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/reports and_memos/index.html

| **Assessment (Theory course)** |
|---|

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

| **Course Curated by** |
|---|

| **Expert from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
|---|---|---|
| Mr.Vijayan Ramanathan ,<br>Project manager,<br>Toppan Merrill. Technologies, | Dr. Aninditha Sahoo,<br>IIT, Madras<br>Dr.P.R.Sujatha Priyadharshini, | Dr. Arokia Lawrence Vijay<br>Dr. Sreejana<br>Dr. Tissaa |

| Coimbatore | Anna University, Chennai<br>Dr. E. Justin Ruben,<br>CIT, Coimbatore | Department of English | |
|---|---|---|---|
| **Recommended by BoS on** | 16.08.2024 | | |
| **Academic Council Approval** | No:27 | **Date** | 24.08.2024 |

| 24HST104 | PROFESSIONAL COMMUNICATION (Common to all Departments) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 0 | 2 |
| HS | | SDG | | | 4, 8 | |

| Pre-requisite courses | - | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to

| 1 | develop students' abilities to craft clear, concise, and well-structured technical content and professional communications |
|---|---|
| 2 | enhance students' communication skills in team settings |
| 3 | equip students with cross-cultural communication skills and effective listening techniques |

## Course Outcomes

| After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|
| CO1 | demonstrate proficiency in crafting clear, concise, and well-structured technical content and professional communications, including emails that meet industry standards. | Ap |
| CO2 | communicate effectively in team settings, showcasing collaboration, conflict resolution, and leadership skills, while employing creative writing techniques to convey complex ideas. | An |
| CO3 | apply principles of cross-cultural communication and effective listening techniques to engage successfully in diverse, globalized professional environments. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | | | | | | 2 | 1 | 3 | 1 | | 3 | | |
| 2 | | | | | | 2 | 3 | 3 | 2 | | 3 | | |
| 3 | | | | | | 1 | 1 | 3 | 1 | | 3 | | |

## Course Content

| Mastering Professional Communication | |
|---|---|
| Industry-specific terminology (Business / Technical Register) - Crafting professional emails - Essential elements of an effective email (subject line, salutation, body, closing) - reading and responding to email communication – Networking Emails - Analyzing and interpreting technical texts (Loud Reading). | 6 Hours |
| **Navigating Digital Media** | 6 Hours |

| | |
|---|---|
| Introduction to Digital media and online communication tools (instant messaging, video conferencing, social media, blogs, forums) - Listening and analyzing advanced audio materials - Creative & Blog Writing (General & Technical). | |
| **Technical Writing Techniques**<br>Writing Reflective Essays / Experience Sharing, Process writing, Transcoding graphics (interpreting technical texts), Writing Reviews (Research Articles & Books). | **6 Hours** |
| **Building a Professional Digital Presence**<br>Creating Digital Profile - Overview of different digital platforms (LinkedIn, GitHub, personal websites) - Setting Up a LinkedIn Profile – Crafting a Video Resume – Digital Etiquette and Professionalism - Cross-cultural communication and diversity awareness. | **6 Hours** |
| **Social Responsibility in Practice**<br>Environmental and social responsibilities - Case studies and real-world applications - Project Work - Writing Project reports. | **6 Hours** |

| Theory Hours: 30 | Tutorial Hours: 0 | Practical Hours: 0 | Project Hours: 0 | Total Hours: 30 |
|---|---|---|---|---|

## Learning Resources

### Reference books

1. Baker, W., & Ishikawa, T. Transcultural Communication Through Global Englishes: An Advanced Textbook for Students. Routledge, 2021.
2. Bodnar, O., Fedak, S., Hinsirovska, I., Denysiuk, N., Perenchuk, O., Plavutska, I., ... & Shchur, N. English for Study and Work: A Coursebook In-class Activities. 2017.
3. Doff, A., Thaine, C., Puchta, H., Stranks, J., & Lewis-Jones, P. Cambridge English Empower Advanced Student's Book. Cambridge University Press, 2016.
4. Hewings, M., Thaine, C., & McCarthy, M. Cambridge Academic English C1 Advanced Student's Book: An Integrated Skills Course for EAP. Cambridge University Press, 2012.
5. Beer, D. F., & McMurrey, D. A. A Guide to Writing as an Engineer. John Wiley & Sons, 2019.

### Online Resources (Web Links)

1. https://hbr.org/2016/07/how-to-write-email-with-military-precision
2. https://ocw.mit.edu/courses/comparative-media-studies-writing/21w-732-scientific-and-technical-communication-spring-2015/
3. https://www.coursera.org/learn/digital-media
4. https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/reports_and_memos/index.html

## Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

## Course Curated by

| Expert from Industry | Expert(s) from Higher Education Institution | Internal Expert(s) |
|---|---|---|
| Mr.Vijayan Ramanathan , Project manager, Toppan Merrill. Technologies, Coimbatore | Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben,CIT, Coimbatore | Dr. Arokia Lawrence Vijay Dr. Hema Department of English |

| Recommended by BoS on | 16.08.2024 | | |
|---|---|---|---|
| Academic Council Approval | No: 27 | Date | 24.08.2024 |

| 24MAI114 | APPLIED LINEAR ALGEBRA AND CALCULUS (Common to CS, IT, AD) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 |
| BS | | SDG | | | 4, 9 | |

| Pre-requisite courses | - | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | understand and apply the concepts of eigenvalues, eigenvectors, and matrix transformations to solve real-world linear algebra problems relevant to computing and data sciences. |
|---|---|
| 2 | develop proficiency in vector spaces, subspaces, and matrix decomposition techniques (LU and SVD) for effective analysis and solution of linear systems in engineering and data analytics. |
| 3 | apply differentiation and integration techniques, including optimization and calculation of areas and volumes, to solve practical problems in engineering and computational contexts. |
| 4 | master multivariate calculus concepts such as partial derivatives, Taylor series, and constrained optimization methods for applications in machine learning and data science algorithms. |
| 5 | provide MATLAB techniques for solving first-order and higher-order ordinary differential equations to model and analyse dynamic systems in computing and engineering. |

## Course Outcomes

| | After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|---|
| CO1 | apply the concepts of eigenvalues and eigenvectors to diagonalize matrices and solve systems of linear equations in real-world applications. | Ap |
| CO2 | apply the concepts of vector spaces, subspaces and matrix decomposition techniques such as LU decomposition and Singular Value Decomposition to solve linear systems and reduce matrix complexity in data science and engineering problems. | Ap |
| CO3 | apply differentiation techniques to solve optimization problems including finding maxima and minima and use integration methods to compute arc lengths, areas between curves and volumes of solids for practical engineering and computational applications. | Ap |
| CO4 | apply multivariate calculus concepts such as partial derivatives and Taylor's series expansion to analyse and approximate multivariable functions for solving engineering and computational problems. | Ap |
| CO5 | analyse and solve constrained and unconstrained optimization problems using the Lagrange multiplier method and determine the maxima and minima of functions with two or more variables relevant to machine learning and data science applications. | An |
| CO6 | analyse methods for solving first-order and higher-order ordinary differential equations to model and analyse dynamic systems in engineering and computing, using appropriate solution techniques to address real-world problems. | An |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1 Engineering Knowledge | 2 Problem Analysis | 3 Design/Development of Solutions | 4 Conduct Investigations of Complex Problems | 5 Engineering Tool Usage | 6 The Engineer and The World | 7 Ethics | 8 Individual and Collaborative Team work | 9 Communication | 10 Project Management and Finance | 11 Life-Long Learning | PSO 1 | PSO 2 |
| 1 | 2 | | | | 2 | | | | | | | | |
| 2 | 1 | 3 | 1 | | 2 | | | | | | | | |
| 3 | 1 | 1 | | 1 | 2 | | | | | | | | |
| 4 | 1 | 1 | | 1 | 2 | | | | | | | | |
| 5 | 1 | | | 1 | 2 | | | | | | | | |
| 6 | 2 | | | | 2 | | | | | | | | |

## Course Content

**MATRICES**

Eigenvalues and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors (Statement only) – Cayley Hamilton theorem (excluding proof) - Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

**9 Hours**

**Practical Component**

Matrix operations like addition, subtraction, multiplication, inverse, rank and transpose, eigenvalues and eigenvectors of a given matrix and verify the diagonalization of the matrix.
Cayley-Hamilton theorem to find the characteristic equation of a matrix and verify that the matrix satisfies its own characteristic equation.

**6 Hours**

**VECTOR SPACES**

Vector spaces and subspaces over real space – Euclidean spaces - Linear independence and dependence - Basis and Dimension - Null spaces, column spaces and Linear transformations - LU decomposition method - Singular Value Decomposition method. (No proofs of any theorems, only problems based on these topics)

**9 Hours**

**Practical Component**

Linearly independent and dependent vectors and Singular Value Decomposition.
Curve Tracing, 3D and Surface plotting.

**6 Hours**

**APPLICATIONS OF CALCULUS**

Differentiation: Mean Value Theorem-Maxima and Minima – Integration: Arc Length, Area between two curves, Area of a Surface of Revolution, Volume of solids

**9 Hours**

**Practical Component**

First and second derivatives of a given function, area between two curves and the volume of a solid of revolution
Optimization problems in single variables.

**6 Hours**

| | |
|---|---|
| **FUNCTIONS OF SEVERAL VARIABLES**<br>Partial derivatives – Homogeneous functions and Euler's theorem –Total derivative – Taylor's series expansion - Maxima and minima of functions of two variables – Constrained maxima and minima: Lagrange's multiplier method with single constraints – Jacobians | **9 Hours** |
| **Practical Component**<br>Computing partial derivatives of multivariable functions<br>Optimization problems in multiple variables | **6 Hours** |
| **ORDINARY DIFFERENTIAL EQUATIONS**<br>Solutions of first order linear ODE: Leibnitz equation and Bernoulli's equation – Linear, homogeneous differential equations of second and higher order with constant coefficients. | **9 Hours** |
| **Practical Component**<br>Solution of first order ordinary differential equations.<br>Solution of second and higher order ordinary differential equations | **6 Hours** |

| Theory | | Tutorial | | Practical | | Project | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| **Hours:** | **45** | **Hours:** | **0** | **Hours:** | **30** | **Hours:** | **0** | **Hours:** | **75** |

## Learning Resources

### Textbooks

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2021
2. Howard Anton and Chris Rorres, "Elementary Linear Algebra", Applications Version, 12th Edition, 2019.

### Reference books

1. Kreyszig E., "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons, 2011.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2018
3. David C. Lay, "Linear Algebra and its Applications", Pearson Education Asia, New Delhi, 6th Edition, 2021
4. Weir, MD, Hass J, Giordano FR: "Thomas' Calculus", Pearson Education, 15th Edition, 2023.

### Online Resources (Web Links)

1. Integral Calculus - Khan Academy https://www.khanacademy.org/math/integral-calculus
2. Linear Algebra by MIT Open Courseware (Free) https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
3. Multivariable Calculus by MIT Open Courseware (Free)
   https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/
4. Khan Academy: Multivariable Calculus (Free)
   https://www.khanacademy.org/math/multivariable-calculus
5. Coursera: Introduction to MATLAB Programming by Vanderbilt University
   https://www.coursera.org/learn/matlab

## Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore. Mr.Jayakumar Venkatesan, Valles Marineris International Private Limited- Chennai. Mr. Imran Khan, GE Transportation Company, Bangalore | Dr.T.Govindan, Government College of Engineering, Srirangam, Trichy. Dr.C.Porkodi, PSG College of Technology, Coimbatore. Dr.P.Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore. | Dr. D. Arivuoli Dr. J. Dhivya Dr. Vijeta Iyer, Department of Mathematics |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| 24PHI101 | **APPLIED PHYSICS FOR COMPUTING** | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 |
| **BS** | **(Common to AD, CS, IT)** | **SDG** | | 7, 9, 12 | | |

| **Pre-requisite courses** | High School Education | **Data Book / Code book (If any)** | - |
|---|---|---|---|

## Course Objectives:

| | The purpose of taking this course is to: |
|---|---|
| 1 | understand and apply fundamental principles of wave behaviour, optics, and acoustics, and their practical applications in engineering. |
| 2 | develop a solid understanding of quantum mechanics and quantum computing, and their relevance to modern technology. |
| 3 | integrate physics principles across mechanics, and thermal physics to solve real-world problems. |
| 4 | foster analytical and problem-solving skills by applying key concepts to real-world engineering and technological challenges. |

## Course Outcomes

| | After successful completion of this course, the students shall be able to | **Revised Bloom's Taxonomy Levels (RBT)** |
|---|---|---|
| CO 1 | apply wave behaviour in optics and demonstrate its applications in real-world technologies. | Ap |
| CO 2 | understand quantum mechanics principles and state their application in quantum information systems. | Ap |
| CO 3 | implement qubits and quantum gates to demonstrate the advantages of quantum computing. | Ap |
| CO 4 | examine the principles of heat transfer mechanisms for effective thermal management in engineering applications. | Ap |
| CO 5 | apply vectors and moments to equilibrium problems in distributed-force systems with free body diagrams | Ap |
| CO 6 | analyse and interpret acoustic principles to assess sound quality and design strategies for effective noise control in real-time applications. | An |

| | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes (CO) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO 1 | PSO 2 |
| 1 | 3 | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | | |
| 3 | 3 | 2 | | | | | | | | | 2 | | |
| 4 | 3 | | | | | | | | | | 2 | | |
| 5 | 3 | 2 | | | | | | | | | | | |
| 6 | 3 | 2 | | | | | | | | | | | |

## Course Content

| | |
|---|---|
| **Applied optics**<br>Wave Behaviour in Optics: Reflection, Refraction, Interference, Diffraction and Polarization (qualitative) - Interaction of light and matter - Absorption - Spontaneous emission - Stimulated emission - Population inversion - $CO_2$ laser - Semiconductor lasers - Applications –Laser Imaging and Holography- Laser gyroscopes- LiDAR- Introduction and importance of Fiber Optics Technology- Propagation mechanism of rays in an optical fibre, Meridional rays, Skew rays- Types of optical fibres -Application of Optical Fibers, Optical fibre Communication system with block diagram. | **9 Hours** |
| **Practical Component**<br> • Semiconductor laser:<br> a) Determination of wavelength of laser<br> b) Determination acceptance angle and numerical aperture of an optical fibre.<br> c) Determination of particle size<br> • Spectrometer – Determination of wavelength of mercury source using grating | **6 Hours** |
| **Quantum physics**<br>Introduction to Quantum Mechanics- Wave Particle duality- Heisenberg uncertainty principle- Wave function- Postulates of Quantum Mechanics- Schrodinger's Equations - Particle in a box- Eigen values and Eigen function- Quantum confinement – quantum wells, wires and dots – Quantum system for information processing - quantum states – classical bits – quantum bits or qubits –CNOT gate - multiple qubits – quantum gates – advantage of quantum computing over classical computing. | **9 Hours** |
| **Practical Component**<br> • Determination of band gap of a semiconductor<br> • Determination of efficiency of solar cell<br> • Determination of Planck's constant – Electroluminescence method | **6 Hours** |
| **Thermal Physics**<br>Transfer of heat energy – conduction, convection, and radiation – thermal expansion of solids and liquids – expansion joints – bimetallic strips – theory of heat conduction in solids – | **9 Hours** |

| | |
|---|---|
| rectilinear flow of heat – determination of thermal conductivity of a bad conductor - Lee's & Charlton's disc method - Thermal Insulation – classification and properties – heat exchangers - applications – Thermal Physics in Virtual Reality and Haptics.<br><br>**Practical Component**<br>Lee's Disc method: Determination of thermal conductivity of a bad conductor | **6 Hours** |
| **Mechanics**<br>Introduction to position vector, force vector and moment vector- 3-D representation of force and couple- their moments about a point or line- Distributed-force systems- Free Body diagram- Equilibrium of a body under 2D/3D force systems- Moment of inertia of plane areas; Perpendicular-axis and parallel axis theorems- Rectilinear and curvilinear motion of a particles- Work and energy- Impulse and momentum. | **9 Hours** |
| **Practical Component**<br><ul><li>Compound pendulum – Determination of acceleration due to gravity</li><li>Non-uniform bending – Determination of Young's modulus</li></ul> | **6 Hours** |
| **Acoustics**<br>Sound basic definitions - Human response to sound and vibration- Range of audible sound pressure levels and frequencies, infra sound, ultrasound-Pitch-Loudness: equal loudness contours and loudness level. Loudness calculations. Principle of superposition of waves, interference, beats, standing waves- Principle of active noise control- Doppler effect. Reverberation - Reverberation time - Absorption coefficient and its determination - Factors affecting the acoustics of the buildings and their remedies. | **9 Hours** |
| **Practical Component**<br>Melde's string – Determination of frequency of a tuning fork | **6 Hours** |

| **Theory** | | **Tutorial** | | **Practical** | | **Project** | | **Total** | |
|---|---|---|---|---|---|---|---|---|---|
| **Hours:** | 45 | **Hours:** | 0 | **Hours:** | 30 | **Hours:** | 0 | **Hours:** | 75 |

## Learning Resources

### Textbooks
1. Optics, Light, and Lasers: The Practical Approach to Modern Aspects of Photonics and Laser Physics, Dieter Meschede, 3rd Edition, Wiley, 2017.
2. Quantum Mechanics, David H. McIntyre, Cambridge University Press, 2022.
3. Introduction to Quantum Control and Dynamics, Domenico D'Alessandro, 2nd Edition, Chapman and Hall/CRC, 2021.
4. Shames, Irving H. Engineering mechanics statics and dynamics. 2022.
5. Engineering Mechanics: Dynamics, James L. Meriam, L. G. Kraige, J. N. Bolton, John Wiley & Sons, 2020.

### Reference books
1. Engineering Acoustics: Noise and Vibration Control, Malcolm J. Crocker, Jorge P. Arenas, John Wiley & Sons, 2021.
2. Engineering Mechanics, Hibbeler, R. C., Pearson Education India, 2010.
3. Pain, Herbert John. The physics of vibrations and waves. 2022.
4. Introductory Quantum Optics, Christopher C. Gerry and Peter L. Knight, Cambridge university press, 2023.
5. Optics for Engineers, Charles A. DiMarzio, Crc Press, 2024.

### Online Resources (Web Links)
1. https://ocw.mit.edu/courses/2-71-optics-spring-2009/
2. https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016/
3. https://ocw.mit.edu/courses/2-051-introduction-to-heat-transfer-fall-2015/
4. https://ocw.mit.edu/courses/2-001-mechanics-materials-i-fall-2006/

5. https://phet.colorado.edu/en/simulations/waves-intro
6. https://www.nasa.gov/directorates/esdmd/hhp/acoustics-and-noise-control/

**Assessment (Embedded course)**

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

**Course Curated by**

| Expert(s) from Industry | Expert(s) from Higher Education Institution | Internal Expert(s) |
|---|---|---|
| | | Capt A.R.Arul<br>Dr. S.Nithya<br>Department of Physics |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| | | L | T | P | J | C |
|---|---|---|---|---|---|---|
| **24CSI006** | **PROGRAMMING IN C** | 3 | 0 | 2 | 0 | 4 |
| **ES** | **(Common to AD, CS, IT)** | **SDG** | | **9** | | |

| **Pre-requisite courses** | **Nil** | **Data Book / Codes / Standards ( If any)** | **Nil** |
|---|---|---|---|

| **Course Objectives:** | **The purpose of taking this course is to:** |
|---|---|
| 1 | Develop logical thinking and problem-solving strategies using algorithms and flowcharts. |
| 2 | Understand and apply fundamental programming constructs in C such as data types, variables, control structures, and I/O operations. |
| 3 | Solve real-world problems using arrays, strings, and modular programming through functions. |
| 4 | Use pointers, storage classes and structures for efficient data handling. |
| 5 | Develop simple C applications using file operations, and basic debugging techniques. |

| **Course Outcomes:** | **After successful completion of this course, the students shall be able to** | **Bloom's Taxonomy Level (BTL)** |
|---|---|---|
| CO 1 | Explain basic C programming constructs and problem-solving strategies using flowcharts and algorithms | U |
| CO 2 | Illustrate the use of conditional and iterative control structures through logic-based programs. | U |
| CO 3 | Apply arrays, strings, and functions to solve computational problems using modular programming. | Ap |
| CO 4 | Apply pointers, storage classes, and structures to efficiently manage data in C programs | Ap |
| CO 5 | Develop simple applications using file operations and debugging tools in C. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO-1 | PSO-2 |
| 1 | 3 | 2 | | | | | | | | | | 3 | |
| 2 | 2 | 3 | | | | | | | | | | 3 | |
| 3 | | | | | | | | | | | | 3 | |
| 4 | 3 | 2 | | | | | | | | | | 3 | |
| 5 | | 2 | 3 | | | | | | | | | 3 | |

## Course Content

| **INTRODUCTION TO PROBLEM SOLVING AND C BASICS** | **9 Hours** |
|---|---|
| Introduction to computer problem-solving – The problem-solving aspect- Top-down design -Building blocks, pseudocode notation, flowcharts – Implementation of | |

| | |
|---|---|
| algorithms –Simple algorithmic problem-solving scenarios – C programming: data types, variables, operators and expressions, input and output operations, control flow using if and switch statements.<br>**Practical Component**<br>Drawing flowcharts, Writing pseudocode for algorithmic problem scenarios, Programs using arithmetic, logical, and relational operators, , Simple logic-based programs: prime number, palindrome, factorial, Fibonacci series | **6 Hours** |
| **FUNCTIONS AND STORAGE CLASSES**<br>Looping and Control Statements :for, while, break, continue,Patterns -Defining a function - Accessing a function - Function prototypes - Passing arguments to a function - Passing arrays to functions - Function with string - Recursion - Storage classes | **9 Hours** |
| **Practical Component**<br>Pattern printing using loops -Programs using functions with arguments and return values, Recursive functions (e.g., factorial, Fibonacci), Passing arrays and strings to functions, Programs demonstrating storage classes: auto, static, extern, register | **6 Hours** |
| **ARRAYS AND STRING**<br>Defining an array - Processing an array - Multidimensional Arrays-Character Arithmetic - Defining a string - NULL character - Initialization of Strings - Reading and Writing Strings - Processing Strings -Searching and Sorting of Strings. | **9 Hours** |
| **Practical Component**<br>Programs for defining and processing 1D and 2D arrays, Searching (linear and binary search), Sorting (bubble sort, selection sort), Matrix operations (addition, subtraction, transpose), String handling using standard functions (strlen, strcpy, etc.) | **6 Hours** |
| **POINTERS, STRUCTURES AND UNIONS**<br>Pointer Fundamentals - Pointer Declaration - Passing Pointers to a Function - Pointers and one-dimensional arrays - operations on pointers - Dynamic memory allocation-Structures and Unions: Defining a Structure - Processing a Structure - User defined data types (Typedef) -Unions | **9 Hours** |
| **Practical Component**<br>Pointer operations and arithmetic, swapping values using pointers, Pointer and array manipulation, Dynamic memory allocation using malloc, calloc, and free, Programs using structures and unions, Accessing structure members using pointers | **6 Hours** |
| **FILES AND DEBUGGING**<br>Files- Opening and Closing a Data File - Reading and writing a data file - Processing a data file -Unformatted data files - Concept of binary files - Accessing a file randomly using fseek- Types of errors: Syntax, Logical, Runtime – Debugging techniques: Tracing with printf(), setting breakpoints, step-by-step execution – Introduction to debugging tools: gcc -g, GDB- Integrated Development Environment- – Best practices in debugging C programs | **9 Hours** |
| **Practical Component**<br>Student record system using structures and files, File read/write operations using text and binary files, Processing structured data from files, Accessing file data using fseek, Debugging C programs using printf() tracing and GDB, Identifying and fixing syntax, logical, and runtime errors | **6 Hours** |

| Theory Hours: | 45 | Tutorial Hours: | | Practical Hours: | 30 | Project Hours: | | Total Hours: | 75 |
|---|---|---|---|---|---|---|---|---|---|

| Learning Resources |
|---|

| **Textbooks** |
|---|
| 1. Byron S Gottfried and Jitendar Kumar Chhabra, "Programming with C", Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.<br>2. E. Balagurusamy, Programming in ANSI C, 8th Edition, McGraw-Hill Education, 2019. |

| **Reference books/ Web Links** |
|---|
| 1. Yashavant Kanetkar, Let Us C, 17th Edition, BPB Publications, 2023.<br>2. R. G. Dromey, *How to Solve It by Computer*, Pearson Education, First Edition, New Delhi, 2008.<br>3. Pradip Dey and Manas Ghosh, Programming in C, 2nd Edition, Oxford University Press, 2011.<br>4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2nd Edition, Pearson Education, 2006.<br>5. Ashok N. Kamthane, Computer Programming, Pearson Education, 2007.<br>6. Reema Thareja, Programming in C, 2nd Edition, Oxford University Press, 2011. |

| **Online Resources** |
|---|
| 1. https://www.geeksforgeeks.org/c-programming-language/<br>2. https://www.w3schools.com/c/<br>3. https://www.programiz.com/c-programming<br>4. https://www.coursera.org/learn/c-for-everyone<br>5. https://www.codingninjas.com/studio/library/c-programming |

| **Assessment (Embedded course)** |
|---|
| CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)<br>Lab Workbook, Experimental Cycle tests, viva-voce |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert** |
| - | - | Ms. R. Nivetha<br>Department of Computer Science and Engineering |
| **Recommended by BoS on** | 09.05.2025 | |
| **Academic Council Approval** | No: 28 | **Date** 26.06.2025 |

| 24CSI102 | **DIGITAL LOGIC CIRCUITS** | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | (Common to AD, CS, IT) | 2 | 0 | 2 | 0 | 3 |
| ES | | SDG | | | 9 | |

| **Pre-requisite courses** | - | **Data Book / Code book (If any)** | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | understand digital systems, number systems, and Boolean algebra for logic simplification and circuit design. |
|---|---|
| 2 | learn to analyse and design Combinational and Sequential Logic Circuits |
| 3 | explore digital logic families and implement logic circuits using programmable devices. |

## Course Outcomes

| After successful completion of this course, the students shall be able to | | **Revised Bloom's Taxonomy Levels (RBT)** |
|---|---|---|
| CO1 | comprehend the fundamental concepts of digital number systems, Boolean algebra, and the basic principles of digital circuit design. | U |
| CO2 | develop and implement logic functions using Boolean algebra, optimizing them through simplification and employing combinational circuit components. | Ap |
| CO3 | construct and validate sequential circuits, such as flip-flops, counters, and shift registers, and integrate these into larger digital systems. | Ap |
| CO4 | develop combinational logic circuits using programmable logic devices. | Ap |

| Course Outcomes (CO) | **Program Outcomes (PO)** (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | **Program Specific Outcomes (PSO)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO-1 | PSO-2 |
| 1 | 3 | | | | | | | | | | | | |
| 2 | | | 3 | | | | | | | | | 3 | |
| 3 | | | 3 | | | | | | | | | 3 | |
| 4 | 3 | 2 | | | | | | | | | | | |

## Course Content

| **OVERVIEW OF DIGITAL SYSTEMS AND BOOLEAN ALGEBRA** Introduction to Digital Systems - Analog vs. Digital Signals – Digital System Design Process- Number base conversions, complements, signed binary numbers – Binary codes-Boolean Algebra and its properties, Boolean functions, Simplification of Boolean functions using Boolean algebra- Canonical and standard forms. | **7 Hours** |
|---|---|
| **Practical Component** Study of logic gates | **4 Hours** |

| | | |
|---|---|---|
| 1. Implement Boolean functions using logic gates and validate the outputs with truth tables | | |

| | |
|---|---|
| **COMBINATIONAL LOGIC CIRCUITS**<br>Overview of Digital Logic Circuits - Simplification of four-variable Boolean functions using Karnaugh maps- Realization of logic gates using NAND and NOR gates –Analysis and design of Combinational Logic Circuits -Half adder, Full adder, Half subtractor, Full subtractor-Code converters - Decoders, Encoders - Multiplexers, Demultiplexers. | **8 Hours** |
| **Practical Component**<br>   1. Design and construct half adders, full adders, half subtractors, and full subtractors.<br>   2. Create combinational circuits to solve real-world problems.<br>   3. Develop a code converter circuit using logic gates.<br>   4. Design and implement decoder and encoder circuits.<br>   **5.** Construct multiplexers and demultiplexers and incorporate them into circuit designs. | **14 Hours** |
| **SEQUENTIAL LOGIC CIRCUITS**<br>SR, JK, D, T flip-flops, Edge-triggering and level-triggering - Asynchronous and synchronous counters - Decade counter, Ring counter - Shift registers (SISO, SIPO, PISO, PIPO). | **8 Hours** |
| **Practical Component**<br>   1. Implement and test various types of shift registers.<br>   2. Design and build a synchronous and asynchronous counter. | **8 Hours** |
| **LOGIC FAMILIES AND PROGRAMMABLE DEVICES**<br>Introduction to digital logic families, RTL, ECL, TTL and CMOS - Programmable Logic Devices - Programmable Logic Array (PLA), Programmable Array Logic (PAL) - Implementation of combinational logic circuits using PLA and PAL. | **7 Hours** |
| **Practical Component**<br>   1. Study of VHDL models for combinatorial circuits. | **4 Hours** |

| Theory | | Tutorial | | Practical | | Project | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| **Hours:** | **30** | **Hours:** | **0** | **Hours:** | **30** | **Hours:** | **0** | **Hours:** | **60** |

| **Learning Resources** |
|---|
| **Textbooks:** |
|    1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", 6th Edition, Pearson, 2018. |
| **References:** |
|    1. C. H. Roth Jr., Larry L. Kinney "Fundamentals of Logic Design", 7th Edition, Cengage Learning, 2014.<br>   2. John F. Wakerly, "Digital Design: Principles and Practices", 5th Edition, Pearson, 2018.<br>   3. Donald P leach, Albert Paul Malvino, Goutam Saha, "Digital Principles and Application", 8th Edition, McGraw Hill education Private Limited, 2015.<br>   4. Clive Woods, Brian Holdsworth, "Digital Logic Design", 4th Edition, O'Reilly Media, 2002.<br>   5. Donald D.Givone, "Digital Principles and Design", 7th Edition, McGraw Hill, 2010. |
| **Online Resources (Weblinks)** |
|      1. Digital Systems: From Logic Gates to Processors | Coursera<br>     2. Digital Logic Circuits and Design | Udemy<br>     3. Digital Electronic Circuits - Course (nptel.ac.in) |

| **Assessment (Embedded course)** |
|---|
| CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| | | Ms. C. Bharathipriya, AP-II<br>Ms. P. Anitha, AP-I<br>Department of Computer Science and Engineering |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| 24HST101 | தமிழர் மரபு / HERITAGE OF TAMILS | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 0 | 1 |
| HS | (Common to all Departments) | SDG | | 4, 11, 16 | | |

| Pre-requisite courses | - | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | தமிழ் மொழி மற்றும் இலக்கியத்தின் அடிப்படை அம்சங்களை அறிமுகப்படுத்துதல், அதன் தொன்மைக்காலம் முதல் நவீனகாலம் வரையிலான வளர்ச்சியை விளக்கம் செய்யுதல். <br><br> Introduce students to the foundational aspects of Tamil language and literature, tracing its evolution from ancient to modern times. |
|---|---|
| 2 | தமிழகத்தின் செழுமையான கலாச்சார பாரம்பரியத்தை அறிமுகப்படுத்துதல், பாறை ஓவியக் கலையிலிருந்து நவீன சிற்ப கலையின்படி அதன் கலை வெளிப்பாடுகளை ஆராய்தல். <br><br> Familiarize students with the rich cultural heritage of Tamil Nadu, exploring its artistic expressions from rock art paintings to contemporary sculptures. |
| 3 | தமிழகத்தின் நாட்டுப்புறக் கலைகள் மற்றும் வீரவிளையாட்டுகளை அறிதல்-திணைக்கோட்பாடுகளை ஆராய்தல்- இந்திய தேசிய இயக்கத்தில் தமிழர்களின் பங்கினை அறிதல். <br><br> To know the folk arts and heroic ames of Tamilnadu-explore the concept of thinai -to know the role of Tamils in Indian National movement. |

## Course Outcomes

| | After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|---|
| CO1 | தமிழ் மொழி மற்றும் இலக்கியத்தின் அடிப்படை அறிவை மேம்படுத்துதல். மொழி பண்பாட்டில் எவ்வாறு இணைந்துள்ளது என்பதை உணர்தல். <br><br> Enhance the fundamental knowledge of Tamil language and literature | U |
| CO2 | பழங்கால பாறை ஓவியங்கள், சிற்பம் என கலைகள் நவீன காலம்வரை எவ்வாறு பயணிக்கிறது என்பதை புரிந்துகொள்ளுதல். <br><br> Understand the heritage, rock art paintings to modern art sculpture | U |
| CO3 | நாட்டுப்புறக் கலைகள் தற்காப்புக் கலைகளாகவும், உடல் ஆரோக்கியத்தை மேம்படுத்தும் விதமாகவும் அமைவதை அறிந்து கலைகள் மீதான ஆர்வத்தை அதிகரிக்கச் செய்தல்- தமிழர்களின் அகத்திணை, புறத்திணை கோட்பாட்டினை புரிந்து கொள்ளுதல். இந்திய பண்பாட்டில் தமிழர்களின் பங்களிப்பை அறிதல். <br><br> Acquire essential knowledge in the folk and martial arts-understanding the Agam and puram concept- to know the contribution of Tamils in Indian culture. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | | | | | | | 3 | 2 | 2 | | 2 | | |
| 2 | | | | | | | 3 | 3 | 2 | | 2 | | |
| 3 | | | | | | | 3 | 2 | 2 | | 2 | | |

| Course Content | |
| --- | --- |
| **மொழி மற்றும் இலக்கியம்**<br>இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தொடக்கம் -பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.<br><br>**LANGUAGE AND LITERATURE**<br>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. | 3 Hours |
| **மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை**<br>நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புற தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.<br>**HERITAGE – ROCK ART PAINTINGS TO MODERN ART SCULPTURES**<br>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. | 3 Hours |
| **நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்**<br>தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள். | 3 Hours |

| | | |
|---|---|---|
| **FOLK AND MARTIAL ARTS**<br>Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Ciabatta, Valari, Tiger dance - Sports and Games of Tami | | |
| **தமிழர்களின் திணைக்கோட்பாடுகள்**<br>தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பொடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் தமிழர்களின் வெற்றி.<br>**THINAI CONCEPTS OF TAMIL**<br>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. | **3 Hours** | |
| **இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**<br>இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ் புத்தகங்களின் அச்சு வரலாறு.<br>**CONTRIBUTIONS OF TAMIL TO INDIAN NATIONAL MOMENT AND INDIAN CULTURE**<br>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. | **3 Hours** | |

| Theory<br>Hours: 15 | Tutorial<br>Hours: 0 | Practical<br>Hours: 0 | Project<br>Hours: 0 | Total<br>Hours: 15 |
|---|---|---|---|---|

**Learning Resources**

**Reference books:**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - 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 C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Textbook 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 Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

| Online Educational Resources: |
| --- |
| 1. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6l BpFoPK_9Y325e |
| 2. https://www.youtube.com/watch?v=j6_ddjn_gLc&list=PLMMrJE4pHZmc0iJZIE6lBp FoPK_9Y325e&index=2 |
| 3. https://docs.google.com/presentation/d/1pf0jbyuDTNdvlcKMnOfoPjbqha7JqdOc/edit#slide=id.p1 |
| 4. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6l BpFoPK_9Y325e&index=1 |

| Assessment (Theory course) |
| --- |
| CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE), Assignments, Quiz, Library Record |

| Course Curated by | | |
| --- | --- | --- |
| **Expert from Industry** | **Expert(s) from Higher Education Institutions** | **Internal Expert** |
| Mr.Vijayan Ramanathan , Project manager, Toppan Merrill. Technologies, Coimbatore | Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore | Suriya Prakash Department of Language |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| 24INP102 | INNOVATION PRACTICUM – 1 | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | (Common to all Departments) | 0 | 0 | 2 | 0 | 1 |
| ES | | SDG | 9, 11, 12 | | | |

| Pre-requisite courses | - | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

| The purpose of taking this course is to: | |
|---|---|
| 1 | analyse the effectiveness of systems thinking and problem-solving methodologies in applying data-driven insights for innovative solution design. |
| 2 | evaluate the impact of transdisciplinary collaboration on creating functional hardware prototypes through fabrication techniques. |
| 3 | understand the future trends and implications of technology in developing innovative products. |

## Course Outcomes:

| After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|
| CO1 | recall the fundamental principles of custom hardware design. | R |
| CO2 | understand the appropriate tools and their applications for solving hardware-related problems. | U |
| CO3 | apply systems engineering concepts to real-world hardware design challenges. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 2 | | 1 | | | | | | | | | | |
| 2 | 2 | | | 1 | | | | | | | | | |
| 3 | | 2 | 2 | 1 | | | | | | | | | |

## Course Content

| Engineering Fundamentals and Innovation | |
|---|---|
| Why engineering? The concept of street fight engineering - Real-world design process and problem-solving methodology - Data-driven insights and concept generation - Case studies of successful engineering innovations. | 3 Hours |
| **Transdisciplinary Systems and Manu'Futuring** | 6 Hours |
| Transdisciplinary systems to accelerate innovation - Manu'Futuring: Technology in hardware manufacturing and manufacturing of hardware technologies - Future scopes with product case studies. | |
| **Building Custom Hardware** | 6 Hours |
| How to build a basic custom hardware - Electronics fundamentals and components - Software for hardware control - Fabrication techniques. | |

| System Thinking and Engineering<br>Introduction to system thinking - Real world as a system - Concept of system engineering and its application – iLenSys. | **7 Hours** |
|---|---|
| Creativity Time and Tech Teardown<br>Creativity exercise: Apply system thinking to a real-world problem - Tech teardown: Analyse a product or system to understand its engineering principles - Presentation: Present your creative project and tech teardown with an engaging title | **8 Hours** |

| Theory | | Tutorial | | Practical | | Project | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| **Hours:** | 0 | **Hours:** | 0 | **Hours:** | 30 | **Hours:** | 0 | **Hours:** | 30 |

## Learning Resources

### Textbooks:
1. Sanjoy Mahajan - Street Fighting Mathematics
2. Donald Knuth - The Art of Computer Programming
3. Think like a programmer: An introduction to creative problem solving
4. Thinking in Systems: A Primer

### References:
1. Learning to code: How to think like a programmer
2. How to find innovative ideas: Ramesh Raskar's note
3. Case study: How Tesla changed the auto industry
4. Ultimate Guide: How to develop a new electronic hardware product

### Online Resources (Weblinks)
1. https://www.ifixit.com/Teardown?srsltid=AfmBOorwzDG9RhJoL3L5tlZ_Dr4sVcey-vPC-pkKTj2E0mWJWtFYlikY
2. https://www.symmetryelectronics.com/technology-teardowns/

## Assessment (Practical course)
Lab Workbook, Experimental Cycle tests, viva-voce

## Course Curated by

| Expert from Industry | Expert from Higher Education Institutions | Internal Expert |
|---|---|---|
| Dr. Mahesh Veezhinathan<br>Director - Innovation Practicum<br>Associate VP - Forge. Innovation | - | Dr. Samuel Ratna Kumar P S<br>Assistant Professor – III<br>Department Mechanical Engineering |
| **Recommended by BoS on** | 17.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| 24HSP111 | HOLISTIC WELLNESS-1 | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 0 | 1 |
| HS | (Common to all Department) | SDG | | 2, 3 | | |

| Pre-requisite courses | - | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | introduce first-year students to the foundational concepts of holistic wellness, emphasizing the integration of physical, mental, emotional, and Internal well-being. |
|---|---|
| 2 | create a balanced lifestyle that promotes overall health and happiness through practical activities. |

## Course Outcomes

| After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|
| CO 1 | understand the basic principles of holistic wellness. | U |
| CO 2 | apply strategies for maintaining physical health, including nutrition and exercise | Ap |
| CO 3 | practice mindfulness techniques to enhance mental and emotional well-being. | Ap |
| CO 4 | develop a personal wellness plan incorporating various aspects of holistic health. | C |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | | | | | | 2 | | 1 | | | | | |
| 2 | | | | | | 2 | | | | | | | |
| 3 | | | | | | 1 | | | | | 3 | | |
| 4 | | | | | | 2 | | | | | 3 | | |

## Course Content

| INTRODUCTION TO HOLISTIC WELLNESS: <br> • Overview of holistic wellness: physical, mental, emotional, and internal health. <br> • The importance of balance in overall well-being. <br> • Hands-on activity: Self-assessment of current wellness status. | 4 Hour |
|---|---|
| PHYSICAL WELLNESS: <br> • Importance of physical activity and exercise. <br> • Understanding nutrition and its role in health. <br> • Sleep hygiene and its impact on well-being. <br> • Hands-on activity: Designing a personalized fitness and nutrition plan. | 14 Hours |

| | |
|---|---|
| **MENTAL AND EMOTIONAL WELLNESS:**<br>• Stress management techniques.<br>• The role of Yoga, mindfulness and meditation in mental health.<br>• Emotional intelligence and its impact on relationships.<br>• Hands-on activity: Practicing Yoga, mindfulness and emotional regulation exercises. | **6 Hours** |
| **INTERNAL WELLNESS:**<br>• Exploring the concept of Internal wellness.<br>• The role of purpose and meaning in life.<br>• Introduction to meditation and reflective practices.<br>• Hands-on activity: Developing a personal reflection, Yoga and meditation routine. | **4 Hours** |
| **INTEGRATING WELLNESS PRACTICES:**<br>• Combining physical, mental, emotional, and Internal wellness practices into daily life.<br>• Developing a balanced wellness plan.<br>• Hands-on activity: Creating a comprehensive personal wellness plan. | **2 Hours** |

| Theory<br>Hours: | 0 | Tutorial<br>Hours: | 0 | Practical<br>Hours: | 30 | Project<br>Hours: | 0 | Total<br>Hours: | 30 |
|---|---|---|---|---|---|---|---|---|---|

| Learning Resources |
|---|

| **Textbooks:** |
|---|
| 1. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).<br>2. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015). |

| **References:** |
|---|
| 1. B.K.S Iyengar., Yoga: The Path to Holistic Health., Dorling Kindersley Limited, City of Publication (2001)<br>2. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).<br>3. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)<br>4. Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)<br>5. Kalderdon Adizes Ichak., What Matters in Life: Lessons I Learned from Opening My Heart ., WS Press, Newtown, PA (2023) |

| **Online Resources (Weblinks)** |
|---|
| 1. Learning Suryanamskar<br>2. Yoga for well-being<br>3. Nutritional Educational contents<br>4. Introduction to Psychology<br>5. Guided Meditation<br>6. Simplified physical exercises instructions<br>7. Simplified Physical Exercises<br>8. Life skills and value education<br>9. James Allen Library |

| **Assessment (Practical course)** |
|---|
| Participation, Practical activities and assignments, personal wellness plan and reflection. |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| | | Dr. Ezhilarasi Principal- KCT |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| 24CSV001 | EMERGING DOMAINS (Common to AD, CS, IT) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 0 | 0 |
| VA | | SDG | | 3, 9, 12, 15 | | |

| Pre-requisite courses | - | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | provide students with a comprehensive understanding of how emerging technologies like AI, IoT, blockchain, big data, and automation are revolutionizing various industries. Focusing on sectors such as agriculture, education, healthcare, gaming, music, law, and textiles, the course explores the application of these technologies to develop innovative solutions that enhance productivity, sustainability, and user engagement. Students will analyze the impact of digital tools on transforming key sectors and evaluate strategies to improve operational efficiency, creativity, and adaptability. Additionally, the course examines the disruption of traditional business models by these technologies, equipping students with the skills to leverage these changes for innovation and competitiveness in a rapidly evolving landscape. |
|---|---|

## Course Outcomes

| After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|
| CO1 — understand the role of digital tools in education and healthcare for enhancing user engagement and fostering innovation. | U |
| CO2 — outline the role of technologies in enhancing agricultural practices to demonstrate how these technologies can improve productivity and sustainability in farming. | U |
| CO3 — relate the key technological applications of emerging domains that enhance operational efficiency and creativity. | R |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 1 | | | | | 2 | | 2 | 3 | | 2 | | |
| 2 | 2 | | | | | 3 | | 2 | 3 | | 3 | | |
| 3 | 2 | | | | | 3 | | 2 | 3 | | 3 | | |

## Course Content

| EDUCATION  LMS – LCMS – MOOC - Coursera equivalent for Indian languages - LLMs for educational content & answering queries of learners - Multiple Intelligence skills - Information Communication Technologies (ICT) - smart class rooms, Attendance management - Library Systems - use of LLMs to scan through books and respond to learner queries - Educational Software - Assessment software student learning progression - Social media for learning language learning apps - Making learning | 3 Hours |
|---|---|

| Topic | Hours |
|---|---|
| accessible to all - apps for social teaching - Direction for learning to attain learning outcomes - Connecting learning with opportunities | |
| **AGRICULTURE (CROPS, DAIRY, POULTRY)**<br>Role of Agriculture in Indian Economy - Soil health and fertility management - Investment and Innovation in Agriculture - Government policies and subsidies for agriculture - Role of startups and agritech companies - Innovations in crop production, dairy, and poultry farming - Challenges in traditional farming methods - Integrating technology for sustainable agriculture - Mobile Apps for Agriculture - Digital marketplaces for agricultural products - Precision Farming - IoT in Agriculture - Drones in Agriculture - Aerial spraying of pesticides and fertilizers - Livestock monitoring and management with drone technology - Cloud Computing in Agriculture - Applications of Blockchain in Agriculture - Ensuring transparency and traceability in the supply chain - Blockchain for smart contracts and payments in agriculture. | **6 Hours** |
| **HEALTHCARE - CLINICAL, PHARMACEUTICAL, MENTAL HEALTH AND REHABILITATION**<br>eHealth-Types of records in healthcare: EHR, EMR, PHR - Generative AI in healthcare - Telemedicine - Wearable IoT in Healthcare - Upgrading the legacy software and data security - Future trends and their Examples - Diabetics and pharmaceutical drugs - Digital twins in healthcare - Phases of clinical trial and their frameworks | **6 Hours** |
| **ROLE OF AI**<br>**AI in Music:** Composition and Production - Sound Design and Mixing - Music Recommendation - Personalized Learning - Rights Management and Copyright<br>**AI in Law:** Legal Research - Contract Analysis and Drafting - Predictive Analytics - Document Automation - Compliance Monitoring<br>**AI in Textiles:** Design and Trend Prediction - Quality Control - Supply Chain Optimization - Personalization and Customization - Sustainability | **6 Hours** |
| **GAMING**<br>Introduction to Gaming and Game design - Game Development Tools and Engines - Graphics and Animation in Games - Artificial Intelligence in Games - Game Programming Usecases - Virtual and Augmented Reality - The Future of Gaming and Emerging Technologies - Job Market and gamification. | **3 Hours** |
| **TAMIL COMPUTING**<br>Introduction to types of AI - Data and Domain - Types of Models - Foundation Models (LLM) - Solving Usecases - Natural Language Processing - NLP Applications - NLP Pipeline - NLP Preprocessing - Why Tamil AI? - Building Tamil AI – Necessities - Data Curation Challenges - Data Curation Framework - Core Components - Models for Tamil - Generative AI: Research Directions - Limitations of Generative AI - Role of the community. | **6 Hours** |

| Theory Hours: 30 | Tutorial Hours: | Practical Hours: | Project Hours: | Total Hours: 30 |
|---|---|---|---|---|

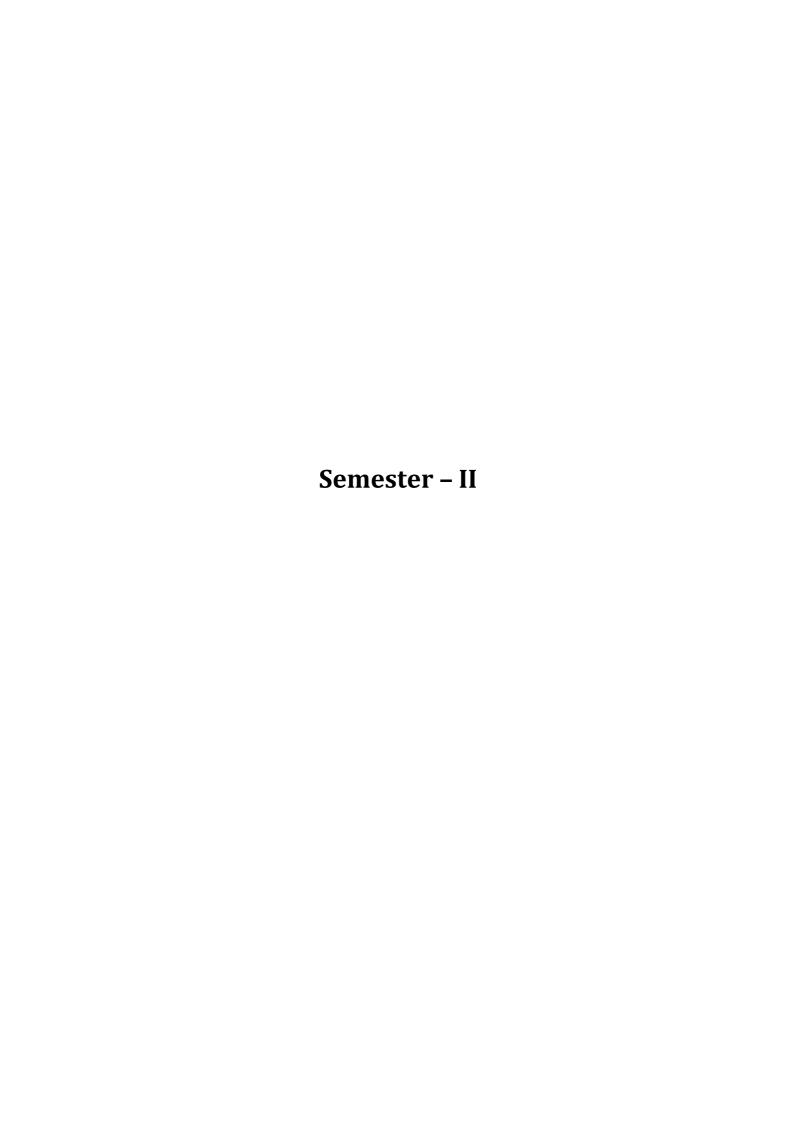| **Learning Resources** |
|---|
| **Online Resources (Weblinks)** |
| 1. Get Interactive: Practical Teaching with Technology | Coursera<br>2. What future for education? | Coursera<br>3. Sustainable Agricultural Land Management | Coursera<br>4. IoT Enabled Farming | Coursera<br>5. Introduction to Healthcare | Coursera<br>6. Game Design and Development 4: 3D Platformer | Coursera |

| **Assessment** |
|---|
| MCQ (10 questions) on every domain in Coursera / Poster Presentation. |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| - | - | Dr. K. Saranya, Mr. V. Senthilkumar, Dr. N. Jeba, Department of Computer Science and Engineering Ms. G. Shobana, Department of IT, Ms. P. R. Rupashini, Ms. G. Preethi, Department of AI&DS |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

# Semester – II

| 24HSP005 | MASTERING CONVERSATIONS (Common to AD, CS, IT) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 0 | 1 |
| HS | | SDG | | 4, 8 | | |

| Pre-requisite courses | - | Data Book / Codes books (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | demonstrate understanding of different perspectives by analyzing complex personal and professional situations. |
|---|---|
| 2 | engage in thoughtful dialogue and discussions about complex, real-world issues, utilizing critical thinking to assess different viewpoints. |
| 3 | apply role-playing as a tool to enhance understanding of workplace dynamics, conflict resolution, and team collaboration. |

## Course Outcomes

| After successful completion of this course, the students shall be able to | | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|---|
| CO 1 | empathize with and understand people in both professional and personal contexts, reflecting on situations from multiple perspectives and participating in activities that mirror career-related scenarios | Ap |
| CO 2 | analyze and converse critically on complex subjects, demonstrating the ability to approach and deal with various social contexts effectively | An |
| CO 3 | exhibit skills in role-playing and enacting given situations to navigate diverse social interactions and career-related contexts. | C |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | | | | | | 3 | | | 3 | 2 | 3 | | |
| 2 | | | | | | | | | 1 | 2 | | | |
| 3 | | | | | | | | | 3 | 2 | | | |

## Course Content

| Practical Component / Roleplays Dynamics | |
|---|---|
| Introduction to Role play - Benefits of role plays - Importance of gesture, tone and modulation-Skill development through role play activities - Types of role plays - | 6 Hours |

| | |
|---|---|
| Conversation Building through communicative functions-Initiating a dialogue- Framing questions- Receiving feedback | |
| **Practical Component /Roleplays on Social Skill**<br>Social Interactions: - (Ordering food at a restaurant- Making a reservation at a hotel-- Shopping at a store-- Attending a party or social gathering)<br>Travel and Tourism:(Asking for directions- Booking a flight or hotel-- Exploring a new city- Interacting with local people)<br>Community and Volunteering:(Participating in a charity event- Volunteering at a local organization- Discussing community issues- Organizing a community project) | **6 Hours** |
| **Practical Component / Roleplays on Education and Technology**<br>Education and Personal Growth:(Setting goals- (Short term & Long term)- Creating a study plan- Participating in a workshop- Reflecting on personal growth)<br>Technology and Online Interactions:(Participating in an online meeting- Creating a social media post- Writing an email or text message- Making an online purchase)<br>Technology and Science:(Explaining a scientific concept- Discussing emerging technologies- participating in Hackathons- Presenting a research paper) | **6 Hours** |
| **Practical Component / Roleplays on Strategic Insights**<br>Critical Thinking :(Evaluating a news article-solving a moral dilemma-Decision with incomplete information-Assessing a historical event)<br>Problem-Solving:(Resolving a conflict- Negotiating a deal - Making a complaint- Apologizing for a mistake)<br>Business and Entrepreneurship:(Pitching an idea- Negotiating a contract- Conducting a market Research- Presenting a product launch) | **6 Hours** |
| **Practical Component / Roleplays on Cultural Exchange**<br>Cultural Exchange:(Sharing customs and traditions- Discussing cultural differences- Exploring historical events- Participating in a cultural festival)<br>Media and Entertainment:( Event planning- Creating an advertisement-Digital Marketing-Conducting interviews- Creating news broadcast- Writing and Performing a script- Enacting one act plays)<br>Arts and Culture:(Visiting an art gallery - Attending/ organizing a concert or play - Discussing literature- Creating a piece of art) | **6 Hours** |

| **Theory** | | **Tutorial** | | **Practical** | | **Project** | | **Total** | |
|---|---|---|---|---|---|---|---|---|---|
| **Hours:** | **0** | **Hours:** | **0** | **Hours:** | **30** | **Hours:** | **0** | **Hours:** | **30** |

| **Learning Resources** |
|---|
| **Reference books** |

1. Bonwell, C. C., & Eison, J. A. (1991). Active learning: Creating excitement in the classroom. Washington, DC: The George Washington University.
2. Harbour, E., & Connick, J. (2005). Role playing games and activities rules and tips. Retrieved from https://www.businessballs.com/roleplayinggames.htm
3. Lebaron, J., & Miller, D. (2005). The potential of jigsaw role playing to promote the social construction of knowledge in an online graduate education course. Retrieved from http://paws.wcu.edu/jlebaron/Jigsaw-FnlTCRpdf_050812.pdf
4. Davies, A. (2018). Teaching and learning through role-play: A practical guide. Maidenhead, UK: McGraw-Hill Education.
5. Young, K. C. (2016). The art of role play: Developing realistic scenarios for skill development. Boston, MA: Pearson.
6. Yardley-Matwiejczuk, K. M. (1997). Role play: Theory and practice. London, UK: SAGE Publications Ltd.

| **Online Resources (Weblinks)** |
|---|
| 1. https://www.niu.edu/citl/resources/guides/instructional-guide<br>2. https://positivepsychology.com/role-playing-scripts/ |

| **Assessment (Practical course)** |
|---|
| Lab Workbook, Experimental Cycle tests, Quizzes and written assignments, Participation in group activities |

| **Assessment** | |
|---|---|
| Formative | Summative |
| Assignments / Mini project, Quiz, Lab | Quizzes and written assignments, Participation in group activities |

| **Course Curated by** | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| Mr.Vijayan Ramanathan, Project manager, Toppan Merrill. Technologies, Coimbatore | Dr. Aninditha Sahoo, IIT, Madras<br>Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai<br>Dr. E. Justin Ruben, CIT, Coimbatore | Dr. Arokia Lawrence Vijay<br>Dr. Tissaa Tony<br>Department of English |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No:27 | **Date** 24.08.2024 |

| 24MAI124 | MULTIVARIATE CALCULUS AND FORECASTING (Common to AD, CS, IT) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 |
| BS | | SDG | | 7, 9 | | |

| Pre-requisite courses | 24MAI114/ Applied Linear Algebra and Calculus | Data Book / Codes books (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | understand the techniques of evaluating double and triple integrals and applying them to calculate areas and volumes. |
|---|---|
| 2 | familiarize students with vector field concepts such as gradient, divergence, and curl, and apply the theorems of Green, Gauss, and Stokes. |
| 3 | develop an understanding of the least squares method for fitting various types of curves and its application in forecasting. |
| 4 | equip students with knowledge of time series analysis, including construction, trend measurement, and seasonal variation determination. |
| 5 | introduce students to numerical methods such as interpolation, numerical differentiation, and numerical integration. |

## Course Outcomes

| | After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|---|
| CO 1 | apply double and triple integrals with constant and variable limit concepts to compute areas and volumes in cartesian coordinates. | Ap |
| CO 2 | calculate gradient, divergence, and curl, and verify Green's theorem, Gauss's divergence theorem, and Stokes' theorem in a given vector field. | Ap |
| CO 3 | assess the reliability of predictions using goodness-of-fit measures like $R^2$, RMSE, MAE, and MAPE for the method of least squares to fit linear, parabolic, cubic, and non-linear curves. | An |
| CO 4 | analyze time series data, and measure trends using methods like moving averages and assess seasonal variations through appropriate techniques. | An |
| CO 5 | apply Newton's interpolation techniques for both forward and backward interpolation, perform numerical differentiation. | Ap |
| CO 6 | apply the concepts of Trapezoidal and Simpson's rules for numerical integration. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO 2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 2 | 2 | | | 2 | | | | | | | | |
| 2 | 2 | | 2 | | 2 | | 2 | | | | | | |
| 3 | 2 | | | 2 | 2 | | | | | | | | |
| 4 | | 2 | | 2 | 2 | | | | | 2 | | | |
| 5 | 2 | | | 2 | 2 | | | | | | | | |
| 6 | 2 | | | 2 | 2 | | | | | | | | |

## Course Content

### MULTIPLE INTEGRALS

Double integration – Cartesian coordinates – Change of order of integration – Triple integration in Cartesian coordinates –Area as double integral and Volume as triple integral. — **9 Hours**

**Practical Component**
- Double and triple integration with constant and variable limits.
- Area as double integral and volume as triple integral. — **6 Hours**

### VECTOR CALCULUS

Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields - Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (Only statements excluding proofs) — **9 Hours**

**Practical Component**
- Evaluation of gradient, divergence, and curl
- Verification of Green's theorem in the plane — **6 Hours**

### CURVE FITTING AND FORECASTING

Method of least squares – Fitting a linear curve, second-degree parabolic curve, cubic curves and non-linear curves of the form $y= ae^{bx}$ , $y= ab^{x}$, $y = ax^{b}$
by the method of least squares – Forecasting Using Fitted Curves – Assessing the reliability of predictions using goodness-of-fit measures such as $R^2$, Adjusted $R^2$, RMSE (Root Mean Square Error), MAE (Mean Absolute Error), and MAPE (Mean Absolute Percentage Error). — **9 Hours**

**Practical Component**
- Fitting polynomials curve by Least Square method.
- Fitting non-linear curves by Least Square method. — **6 Hours**

### TIME SERIES

Time series – Components of Time series – Construction of Time series – Measurement of Trend: Determination of trend by moving averages – Measurement of Seasonal — **9 Hours**

| | |
|---|---|
| Variations: Method of Simple Average, Ratio to Trend Method and Ratio to moving average method.<br><br>**Practical Component**<br>• Time series construction and Measurement of Trend by Moving Averages.<br>• Simple Average, Ratio to Trend Method and Ratio to Moving Average Method to determine seasonal variations in a time series dataset | **6 Hours** |
| **NUMERICAL DIFFERENTIATION AND INTEGRATION**<br>Interpolation – Newton's forward and backward interpolation – Newton's divided difference interpolation –Numerical differentiation by using Newton's forward, backward and divided differences – Numerical integration by using Trapezoidal and Simpson's 1/3rd and 3/8th rules | **9 Hours** |
| **Practical Component**<br>• Numerical Differentiation - Newton's divided differences.<br>• Numerical Integration using Trapezoidal and Simpson's rule. | **6 Hours** |

| Theory | | Tutorial | | Practical | | Project | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| Hours: | 45 | Hours: | 0 | Hours: | 30 | Hours: | 0 | Hours: | 75 |

## Learning Resources

### Textbooks

1. Kreyzig E., "Advanced Engineering Mathematics", 10th Edition, John Wiley and sons, 2023
2. A. Montgomery D.C., Johnson. L.A., Gardiner J.S., "Forecasting and Time series Analysis", McGraw Hill, 1990
3. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 7th Edition, Pearson Education Asia, New Delhi
4. Numerical Methods for Scientific and Engineering Computation by M.K. Jain, S.R.K.Iyengar and R.K. Jain, New Age International Publishers 2007.
5. Gupta S.C and Kapoor V.K, "Fundamentals of Mathematical Statistics", 11th extensively revised edition, Sultan Chand & Sons, 2007.

### Reference books

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2014.
2. Weir, MD, Hass J, Giordano FR: "Thomas' Calculus", Pearson Education, 15th Edition, 2023
3. Kandasamy P., Thilagavathy K. and Gunavathy K., "Numerical Methods", S. Chand Co. Ltd., New Delhi, 2007.
4. David C. Lay, "Linear Algebra and its Applications", Pearson Education Asia, New Delhi, 6th Edition, 2021
5. Anderson, T. W, "An Introduction to Multivariate Statistical Analysis", John Wiley and Sons, 2003.

### Online Resources (Web Links)

1. **Double and Triple Integrals** (Khan Academy): https://www.khanacademy.org/math/multivariable-calculus/integrating-multivariable-functions
2. **Gradient, Divergence, and Curl** (Paul's Online Math Notes): http://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx
3. **Method of Least Squares and Curve Fitting** (Wolfram MathWorld): https://mathworld.wolfram.com/LeastSquaresFitting.html
4. **Introduction to Time Series Analysis** (Coursera - University of London): https://www.coursera.org/learn/time-series-analysis
5. **Numerical Integration (Trapezoidal and Simpson's Rule)** (Khan Academy): https://www.khanacademy.org/math/ap-calculus-bc/bc-integration-new/bc-6-14/a/numerical-integration

| Assessment |
|---|
| CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore. Mr. Jayakumar Venkatesan, Valles Marineris International Private Limited- Chennai. Mr. Imran Khan, GE Transportation Company, Bangalore | Dr.T. Govindan, Government College of Engineering, Srirangam, Trichy. Dr.C. Porkodi, PSG College of Technology, Coimbatore. Dr.P. Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore. | Dr. Vijeta Iyer Dr.K.P. Thilagavathy Ms. Princy Flora Department of Mathematics |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| 24CSI007 | PYTHON PROGRAMMING | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | (Common to AD, CS, IT) | 2 | 0 | 2 | 0 | 3 |
| ES | | SDG | | 9 | | |

| Pre-requisite courses | Nil | Data Book / Code book (If any) | Nil |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| | |
|---|---|
| 1 | Introduce the basics of Python, including data types, operators, and control structures |
| 2 | Develop proficiency in iterative statements, string handling, and data structures like lists, tuples, and dictionaries. |
| 3 | Provide knowledge on modules, functions, object-oriented programming concepts, and file handling. |
| 4 | Familiarize students with exception handling and Python's standard libraries like NumPy and Pandas. |
| 5 | Enable students to apply Python concepts to solve real-world problems through practical experiments. |

## Course Outcomes

| After successful completion of this course, the students shall be able to | | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|---|
| CO1 | Understand Python syntax, data types, operators, and basic control structures | U |
| CO2 | Apply conditional and iterative constructs for solving logical problems. | Ap |
| CO3 | Implement modular programming concepts, handle strings, and utilize data structures efficiently | Ap |
| CO4 | Demonstrate object-oriented programming, file handling, and exception handling in Python. | Ap |
| CO5 | Utilize libraries like NumPy and Pandas for data analysis and manipulation. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO-1 | PSO-2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Teamwork | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 3 | | | | | | | | | | | 3 | |
| 2 | 3 | | | | | | | | | | | 3 | |
| 3 | | 2 | | | | | | | | | | 3 | |
| 4 | | | 2 | | | | | | | | | 3 | |
| 5 | | | | | | | | | | | | 3 | |

## Course Content

| PYTHON BASICS AND CONTROL STRUCTURES | 6 Hours |
|---|---|
| Python Basics: Python syntax – Variables - Data Types - Type Casting - Arithmetic & Logical Operators. Conditional Branching Statements: if, if-else, if-elif-else, nested conditions. Iterative Statements: for loop, while loop, Loop Control | |

| | |
|---|---|
| Statements. Functions and Lambda Functions: Defining functions, Function arguments - Return values - Anonymous Lambda Functions. **Practical Component** Implement basic Python programs to demonstrate data types, operators, and I/O. Develop programs using conditional statements - if, if-else, nested conditions. Write Python scripts using loops to generate patterns and series. Implement Python functions and lambda functions with different argument types. | **6 Hours** |
| **PYTHON MODULES, STRINGS, AND DATA STRUCTURES** Modules - built-in and user-defined modules - String Handling: String slicing, concatenation, formatting, and methods-List: Creating lists- List indexing- List methods - List comprehension. Tuple - Characteristics of tuples- Tuple indexing, Tuple methods. Dictionary: Key-value pairs, Dictionary methods. | **6 Hours** |
| **Practical Component** Create Python scripts to demonstrate string manipulation techniques. Perform operations on lists, tuples, and dictionaries using various methods. | **6 Hours** |
| **OBJECT-ORIENTED PROGRAMMING** Classes and Objects: OOP concepts - Creating classes and objects - Self parameter - init method. Inheritance & Polymorphism: Types of inheritance Method Overriding, Method Overloading in Python. | **6 Hours** |
| **Practical Component** Develop a simple OOP-based application to demonstrate classes, objects, inheritance, and polymorphism. | **6 Hours** |
| **FILE HANDLING AND EXCEPTION HANDLING** File Handling: Reading and writing files, File modes - Working with text and CSV files. Exception Handling: Understanding exceptions - Handling exceptions using try-except-finally - Raising custom exceptions. | **6 Hours** |
| **Practical Component** Read and write text and CSV files using Python file handling methods. Implement exception handling with custom exceptions in Python. | **6 Hours** |
| **PYTHON LIBRARIES** NumPy Library: Introduction to NumPy, Arrays, Array creation and manipulation, Array operations - Pandas Library: Series - Creating Series – Indexing - Operations on Series. DataFrames: Creating DataFrames - Data Manipulation - Handling Missing Data. | **6 Hours** |
| **Practical Component** Perform basic operations on NumPy arrays. Manipulate data using Pandas Series and DataFrames, including handling missing values. | **6 Hours** |

| Theory Hours:30 | Tutorial Hours:0 | Practical Hours: 30 | Project Hours:0 | Total Hours:60 |
|---|---|---|---|---|

| Learning Resources |
|---|
| **Textbooks** |
| 1. Mark Lutz, "Learning Python," O'Reilly Media, 6th Edition, 2025. <br> 2. Y. Daniel Liang, "Introduction to Programming Using Python," Pearson, 1st Edition, 2017. |
| **Reference** |
| 1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist," Green Tea Press, 2nd Edition, 2015. <br> 2. Zed A. Shaw, "Learn Python the Hard Way," Addison-Wesley, 5th Edition, 2024. |
| **Online Resources (Weblinks)** |
| 1. Python Documentation: https://docs.python.org/3/tutorial/index.html <br> 2. Microsoft Learn: https://learn.microsoft.com/en-us/shows/intro-to-python-development/ <br> 3. Udacity: https://www.udacity.com/course/introduction-to-python--ud1110 <br> 4. Geeksforgeeks: https://www.geeksforgeeks.org/courses/python-course-certification-free |

5. NPTEL: https://onlinecourses.nptel.ac.in/noc24_cs57/preview
6. Coursera: https://www.coursera.org/projects/python-for-data-analysis-numpy

## Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) , Lab Workbook, Experimental Cycle tests, viva-voce

## Course Curated by

| Expert(s) from Industry | Expert(s) from Higher Education Institution | Internal Expert(s) |
|---|---|---|
| - | - | Rupashini P R, Assistant Professor, Department of Artificial Intelligence and Data Science |
| **Recommended by BoS on** 09.05.2025 | | |
| **Academic Council Approval** No: 28 | **Date** 26.06.2025 | |

| 24ITI001 | **EMBEDDED SYSTEMS** | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 |
| ES | | SDG | | 4,9 | | |

| **Pre-requisite courses** | **24CSI102 Digital Logic Circuits** | **Data Book / Codes / Standards ( If any)** | |
|---|---|---|---|

| **Course Objectives:** | |
|---|---|
| **The purpose of taking this course is to:** | |
| 1 | Introduce the architecture and operational characteristics of embedded systems, microprocessors, and microcontrollers. |
| 2 | Impart foundational skills in 8086 assembly language programming for arithmetic, logical, and control operations. |
| 3 | Enable learners to interface microcontrollers with sensors and implement embedded applications using various hardware platforms. |
| 4 | Familiarize students with sensor integration, embedded communication protocols, and IoT-based system development. |

| **Course Outcomes**: | | |
|---|---|---|
| **After successful completion of this course, the students shall be able to** | | **Revised Bloom's Taxonomy Level (RBT)** |
| CO 1 | Understand the fundamental architecture and operation of embedded systems, including the roles and characteristics of microprocessors and microcontrollers. | U |
| CO 2 | Apply programming techniques to manage hardware interrupts and control I/O operations. | Ap |
| CO 3 | Interface sensors and peripherals with microcontrollers and control I/O devices through embedded programming. | Ap |
| CO 4 | Design and implement an IoT-enabled embedded system that integrates multiple sensors and supports communication with external devices using standard protocols. | An |

| Course Outcomes (CO) | **Program Outcomes (PO)** (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | **Program Specific Outcomes (PSO)** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO-1 | PSO-2 | PSO-3 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | | |
| 1 | 3 | 2 | 3 | | 2 | | | | | | 2 | 3 | | |
| 2 | 3 | 2 | 3 | | 3 | | | | | | 2 | 3 | 2 | |
| 3 | 2 | | 3 | | 2 | | | | | | 2 | 3 | | |
| 4 | | 3 | 3 | | 3 | | | | | | 2 | 2 | | |

| Course Content | |
|---|---|
| **FUNDAMENTALS OF EMBEDDED SYSTEMS AND MICROPROCESSOR** <br> Overview of Embedded Systems: Characteristics, system architecture, and design challenges. Introduction to Microprocessors and Microcontrollers- 8086 Microprocessor Architecture-Internal operations - Addressing modes -Instruction formats | **6 Hours** |
| **Practical Component** <br> 1. Basic Assembly Program: ALP to perform 16-bit arithmetic operations | **6 Hours** |
| **MICROPROCESSOR PROGRAMMING** <br> 8086 Assembly Language Programming - The Instruction Set - Types of Instructions - Data Transfer - Arithmetic - Logical - Shift and Rotate - Flag Control - Compare - Control Flow and Jump Instructions - Subroutine - Loop and String Handling Instructions - Interrupt Mechanism - Types and Priority - Enabling and Disabling of Interrupts. | **8 Hours** |
| **Practical Component** <br> 1. ALP to perform Logical Operations, Shift and Rotate <br> 2. ALP to perform Looping and Subroutine Implementation <br> 3. ALP to perform Sorting and Data Movement | **8 Hours** |
| **MICROCONTROLLER ARCHITECTURE AND EMBEDDED PROGRAMMING** <br> 8051 Microcontroller Architecture- Internal Components- Instruction Set Architecture- I/O Ports and Peripherals- Interrupts and Interrupt Handling - Embedded Programming - Bitwise Operations and Port Control. Peripheral Interfaces: Basics of CAN, LIN, SPI, I2C for embedded communication. | **8 Hours** |
| **Practical Component** <br> **(Using Arduino/Raspberry Pi/NodeMCU)** <br> 1. Interfacing sensor with a microcontroller and display the sensor readings on an LCD. <br> 2. Use interrupts to toggle an LED based on a button press | **8 Hours** |
| **FUNDAMENTALS OF IOT AND SENSOR INTEGRATION** <br> Introduction to Internet of Things – Basics - Sensor and Actuators-Overview of temperature sensors, pressure sensors, accelerometers, gyroscopes, and actuators, applications. Complete Design of Embedded System - System Integration and Case Studies: Developing and testing prototypes using development boards. | **8 Hours** |
| **Practical Component** <br> **(Using Arduino/Raspberry Pi/NodeMCU)** <br> 1. Combine data from an accelerometer and gyroscope to estimate the orientation of a device. <br> 2. Design and implement a small embedded system that integrates multiple sensors and communicates with other devices. (Example, a simple weather station that measures temperature, humidity, and pressure, and sends the data to a central system. | **8 Hours** |

| Theory | | Tutorial | | Practical | | Project | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| **Hours:** | **30** | **Hours:** | | **Hours:** | **30** | **Hours:** | | **Hours:** | **60** |

| Learning Resources |
|---|
| **Reference books/ Web Links** |
| 1. Raj Kamal, *"Embedded Systems: Architecture, Programming and Design,"* McGraw Hill Education, Third Edition, 2021. <br> 2. B. Ram, "Fundamentals of Microprocessors and Microcontrollers," Dhanpat Rai Publications, Seventh Revised Edition, 2019 <br> 3. Arshdeep Bahga, Vijay Madisetti, *"Internet of Things: A Hands-On Approach,"* Universities Press, First Edition, 2015. |

| | | |
|---|---|---|
| 4. | Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware," McGraw Hill Education, Third Edition (Special Indian Edition), 2021. | |

**Online Resources**

1. https://www.coursera.org/learn/iot
2. https://www.coursera.org/learn/introduction-iot-boards
3. https://www.arduino.cc/

**Assessment (Embedded course)**

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) , Lab Workbook, Experimental Cycle tests, viva-voce

**Course Curated by**

| Expert(s) from Industry | Expert(s) from Higher Education Institution | Internal Expert |
|---|---|---|
| - | - | Dr. C. Bharathi Priya Department of Computer Science and Engineering |
| **Recommended by BoS on** | 09.05.2025 | |
| **Academic Council Approval** | No: 28 | **Date** 26.06.2025 |

| 24ADT015 | FINANCE, ECONOMICS AND MARKETING (Common to AD, CS, IT) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 0 | 3 |
| HS | | SDG | | 8 | | |
| **Pre-requisite courses** | Nil | **Data Book / Codes / Standards (If any)** | | Nil | | |

## Course Objectives:

| The purpose of taking this course is to: | |
|---|---|
| 1 | Understand core concepts of managerial economics and apply demand estimation techniques in business decision-making. |
| 2 | Gain foundational knowledge of cost and financial accounting for analyzing and preparing basic financial statements. |
| 3 | Develop skills in financial statement analysis and cash-flow management for strategic financial planning. |
| 4 | Apply marketing principles and research analytics to formulate integrated, data-driven growth strategies. |

## Course Outcomes

| | After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|---|
| CO1 | Apply core economic concepts (demand, supply, elasticity, utility) to managerial decision-making. | Ap |
| CO2 | Record, summarise and interpret fundamental financial transactions in accordance with generally accepted accounting principles (GAAP/Ind-AS). | Ap |
| CO3 | Analyse and evaluate corporate performance using the three key financial statements and cash-flow-based metrics (EBITDA, FCF, EVA). | An |
| CO4 | Design customer-centred marketing strategies that integrate traditional and digital channels to create, communicate and capture value. | Ap |
| CO5 | Employ data-driven market research and analytics to segment, target and position offerings and to forecast demand under uncertainty. | An |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO-1 | PSO-2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 3 | | 2 | 2 | | | | | | | | | |
| 2 | | 2 | | | | | | | | | | | |
| 3 | | 2 | | | | | | | | | 2 | | |
| 4 | | 2 | | | | | | | | | 2 | | |
| 5 | | 2 | | | | | | | | | | 3 | 3 |

| Course Content | |
|---|---|
| **MANAGERIAL ECONOMICS & DEMAND ESTIMATION**<br>Managerial goals vs. shareholder value; Law of demand & supply; elasticity (price, income, cross); marginal utility & consumer surplus; exceptions to the law of demand; quantitative & qualitative demand-forecasting techniques (time-series, causal models, Delphi, big-data tools); introduction to behavioural economics for managers. | **9 Hours** |
| **COST & FINANCIAL ACCOUNTING FUNDAMENTALS**<br>Cost concepts—fixed, variable, stepped, sunk, opportunity, relevant; economies & diseconomies of scale; cost-volume-profit analysis; accounting principles & conventions, double-entry system, journal-ledger-trial balance; the accounting equation; preparation of basic Income Statement and Balance Sheet. | **9 Hours** |
| **FINANCIAL STATEMENT ANALYSIS & CASH-FLOW MANAGEMENT**<br>Operating vs. financing & investing cash flows; preparation of the Statement of Cash Flows (IND-AS 7); working-capital management; ratio analysis—liquidity, leverage, profitability, efficiency; advanced cash-flow metrics (EBITDA, FCF, EVA); brief introduction to valuation multiples. | **9 Hours** |
| **MARKETING PRINCIPLES IN THE DIGITAL ERA**<br>Evolution of marketing & the holistic marketing concept; Marketing vs. Selling; customer value & satisfaction; 7 Ps and extended service mix; product-life-cycle strategies; overview of digital marketing (SEO, SEM, social, content, influencer); omnichannel customer journeys. | **9 Hours** |
| **MARKET RESEARCH, ANALYTICS & STRATEGIC INTEGRATION**<br>Marketing-information systems (MIS); environmental & competitor scanning (PESTLE & Porter 5-forces); STP—segmentation techniques, targeting criteria, positioning maps; basics of marketing analytics (A/B testing, RFM, CLV); integrating finance & marketing for growth strategy—profit-impact of marketing decisions, budgeting, ROI dashboards; capstone case discussion. | **9 Hours** |

| Theory<br>Hours:45 | Tutorial<br>Hours: 0 | Practical<br>Hours: 0 | Project<br>Hours: 0 | Total<br>Hours:45 |
|---|---|---|---|---|

| Learning Resources |
|---|
| **Textbooks** |
| 1. P. Geetika, P. Roy Chowdhury & P. Ghosh. Managerial Economics (3e), McGraw-Hill (2017).<br>2. V. G. Narayanan. An Easy Introduction to Financial Accounting: A Self-Study Guide (2020).<br>3. Philip Kotler, Kevin Lane Keller. Marketing Management (16e), Pearson (2022). |
| **Reference** |
| 1. D. N. Gujarati & D. C. Porter. Essentials of Econometrics (4e), McGraw-Hill (2009).<br>2. C. Dougherty. Introduction to Econometrics (4e), OUP (2020).<br>3. Tapan K. Panda. Marketing Management: Text & Cases (3e), Excel Books (2023).<br>4. Mike Grigsby. Marketing Analytics: Strategic Models & Metrics, Kogan Page (2022).<br>5. Peter Atrill & Eddie McLaney. Financial Accounting for Decision Makers (9e), Pearson (2021). |
| **Online Resources (Weblinks)** |
| 1. https://fulfillment.shiprocket.in/blog/demand-estimation/<br>2. https://www.coursera.org/learn/uva-darden-financial-accounting<br>3. https://www.investopedia.com/articles/stocks/07/easycashflow.asp<br>4. https://handbook.flinders.edu.au/topics/2025/busn1022<br>5. https://insight7.io/marketing-research-and-insights-8-integration-techniques/ |

| Assessment (Theory course) |
|---|
| CAT, Activity and Learning Task(s), MCQ, End Semester Examination (ESE) |

| Course Curated By | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institutions** | **Internal Expert(s)** |
| - | - | Aman Kumar Dubey<br>Assistant Professor & Program Head/MBA IEV |
| **Recommended by BoS on** | 09.05.2025 | |
| **Academic Council Approval** | No: 28 | **Date** 26.06.2025 |

| 24HST102 | தமிழரும் தொழில்நுட்பமும்/ | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 0 | 1 |
| HS | TAMILS AND TECHNOLOGY | SDG | | | 4, 8 | |

| Pre-requisite courses | - | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | தமிழர்களின் நெசவு மற்றும் பானைத் தொழில்நுட்பத்தை அறிமுகப்படுத்துதல், சங்க கால கட்டிட தொழில்நுட்பத்தை விளக்குதல், கோயில்கள் மற்றும் சிற்பக்கலைகளை ஆராய்தல். <br> introducing weaving and pottery technology of Tamils -Explaining the building technology of the Sangam Period-Explore temples and sculptures. |
|---|---|
| 2 | கப்பல், இரும்பு, நாணயங்கள், மணி உருவாக்கும் தொழிற்சாலைகள், ஆகியவற்றை விளக்கம் செய்தல், தமிழகத்தின் தொல்லியல் சான்றுகளின் பழமையை உணர்த்துதல். <br> explain Ship, Iron, Coins, Beads Making Factories. Realizing the Antiquity of Archaeological Evidence of Tamil Nadu |
| 3 | வேளாண்மை மற்றும் அறிவியல் தமிழைப் பற்றி அறிதல், இணையத்தில் தமிழின் தேவையை உணர்த்துதல்,தமிழ் மென்பொருள்களை அறிமுகம் செய்தல். <br> knowledge of Agricultural and Scientific Tamil, Realizing the need for Tamil on the Internet, Introducing Tamil software. |

## Course Outcomes:

| After successful completion of this course, the students shall be able to | | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|---|
| CO 1 | தமிழர்களின் நெசவு மற்றும் பானைத் தொழில்நுட்பத்தின் முக்கியத்துவத்தினை அறிந்து கொள்ளுதல். சங்ககால தமிழர் வளர்த்த அழகுக் கலைகளை தெரிந்து கொள்ளுதல். <br> know the importance of weaving and pottery technology of Tamils-To know the Aesthetics arts developed by Sangam Tamils | U |
| CO 2 | கப்பல் கட்டும் கலை, இரும்புத் தொழிற்சாலை, நாணயங்கள் அச்சடித்தல்,மணி உருவாக்கும் தொழிற்சாலைகள், சிலப்பதிகாரத்தில் உள்ள மணிகளின் வகையை அறிதல். <br> knowledge of ship building, ironworks, coinage, minting, and beads making factories,Knowing the types of beads in Silapathikaram. | U |
| CO 3 | வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பத்தை அறிந்து கொள்ளல். அறிவியல் தமிழ் மற்றும் கணினித் தமிழைப் புரிந்து கொள்ளுதல். <br> know agriculture and irrigation technology. Understanding Scientific Tamil and Computer Tamil. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO 1 | PSO 2 |
| 1 | 2 | | 2 | | | | 3 | 2 | 2 | | 2 | | |
| 2 | 2 | | 2 | | | | 3 | 2 | 2 | | 2 | | |
| 3 | 2 | | 2 | | | | 3 | 2 | 2 | | 2 | | |

## Course Content

| | |
|---|---|
| **நெசவு மற்றும் பானைத் தொழில்நுட்பம்:**<br><br>*சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.*<br><br>Weaving Industry during Sangam Age - Ceramic technology - Black and Red Ware Potteries (BRW)-Graffiti on Potteries. | **3 Hours** |
| **வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:**<br><br>*சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ரு சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் -சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.*<br><br>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. | **3 Hours** |
| **உற்பத்தித் தொழில் நுட்பம்:**<br><br>*கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள்- நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் -தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.*<br><br>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 evidence - Gem stone types described in Silappathikaram. | **3 Hours** |
| **வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:** | |

| | |
|---|---|
| அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம்- கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள்- வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம். <br><br> 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. | 3 Hours |
| **அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:** <br><br> அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள்- சொற்குவைத் திட்டம். <br><br> 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. | 3 Hours |

| Theory | | Tutorial | | Practical | | Project | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| Hours: | 15 | Hours: | 0 | Hours: | 0 | Hours: | 0 | Hours: | 15 |

## Reference books

1. தமிழக வரலாறு மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

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 Tarnils 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 Textbook and Educational Services Corporation> Tamil Nadu)

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 Bookand Educational Services Corporation> Tamil Nadu)

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

## Online Resources

1. https://www.youtube.com/watch?v=Gp1ratX2sOE&list=PLtyn2o7hocf40PtPibRqJTf_dQL3eOtLl
2. https://www.youtube.com/watch?v=jteRvnNiD6w

| **Assessment (Theory course)** |
|---|
| CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) |

| **Course Curated by** | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| - | - | - |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| 24INP103 | INNOVATION PRACTICUM – II | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 0 | 1 |
| ES | (Common to All branches) | SDG | | 9, 11, 12 | | |

| Pre-requisite courses | - | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | equip students with essential tools and techniques for leveraging open-source technologies to develop proof-of-concepts and prototypes |
|---|---|
| 2 | provide hands-on experience and participants will gain a comprehensive understanding of the entire product development process |
| 3 | final prototyping, empowering them to transform their ideas into tangible outcomes |

## Course Outcomes

| After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|
| CO 1 | analyse the effectiveness of various electronic tools and techniques in product development processes | An |
| CO 2 | develop and implement functional software prototypes using open-source tools | Ap |
| CO 3 | design and fabricate 3D models using digital fabrication techniques | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO 1 | PSO 2 |
| 1 | 3 | 2 | 2 | 2 | 2 | | | | | | | | |
| 2 | 2 | 2 | 2 | | 2 | | | | | | | | |
| 3 | 2 | 2 | 3 | 2 | 2 | | | | | | | | |

## Course Content

| INTRODUCTION TO OPEN-SOURCE TOOLS AND TECHNIQUES Explore the concept of open-source, its underlying principles and its contrast with proprietary software, Discuss the advantages of using open-source tools, such as lower costs, increased innovation, educational value, and community support, walk through to the commonly used open-source tools for electronics design (KiCad, FreeCAD), software development (Python, Eclipse), and fabrication (Cura, LinuxCNC). | 3 Hours |
|---|---|
| ELECTRONICS FUNDAMENTALS AND TOOLS Introduction to basic electronic components (resistors, capacitors, transistors, etc.), Understanding of electronic circuits and their functions, Hands-on practice with CircuitJS and Falstad, Simulating and analysing electronic circuits, Introduction to | 6 Hours |

| | |
|---|---|
| Arduino and Raspberry Pi, exploring their capabilities and applications, Designing PCBs using KiCad and EasyEDA, Understanding PCB fabrication processes | |
| **SOFTWARE PROTOTYPING AND TOOLS**<br>Benefits of rapid prototyping in product development, Iterative design and testing, Wireframing tools (Balsamiq, Figma), UI design tools (Sketch, Figma), Programming languages (Python, JavaScript), Testing frameworks (Selenium), No-code platforms (Bubble, Adalo, Wix, AppGyver), Building functional prototypes without extensive coding | **6 Hours** |
| **FABRICATION AND PROTOTYPING**<br>Overview of fabrication techniques (3D printing, laser cutting, CNC machining), Prototyping methods for physical products, using tools like Blender, TinkerCAD, or Fusion 360, Creating 3D models for physical prototypes, Hands-on experience with laser cutting and engraving, Understanding their applications and limitations | **7 Hours** |
| **SIMULATION & DEMONSTRATION**<br>Integrated project demonstration, explaining the design process, technical choices, and outcomes, simulation showcase to demonstrate their understanding of various technical tools and prototyping techniques | **8 Hours** |

| Theory Hours: | 0 | Tutorial Hours: | 0 | Practical Hours: | 30 | Project Hours: | 0 | Total Hours: | 30 |
|---|---|---|---|---|---|---|---|---|---|

| Learning Resources |
|---|
| **Textbooks:** |
| 1. Damir Godec, Joamin Gonzalez-Gutierrez, Axel Nordin, Eujin Pei, Julia Ureña Alcázar, A guide to additive manufacturing, Springer – 2022. https://doi.org/10.1007/978-3-031-05863-9<br>2. Introducing SolidWorks, Dassault Systems. |
| **References:** |
| 1. Insight into Electronics<br>2. Microcontroller Programming with Arduino and Python<br>3. Fundamentals of 3D modelling |
| **Online Resources (Weblinks)** |
| 1. Google Play store apps:<br>    a.  https://play.google.com/store/apps/details?id=com.electronicslab<br>    b.  https://play.google.com/store/apps/details?id=it.android.demi.elettronica<br>2.  https://engservices-ece.sites.olt.ubc.ca/files/2020/01/SolidWorks-3D-Printing-Tutorial-R2.pdf |

| Assessment (Practical course) |
|---|
| Lab Workbook, Experimental Cycle tests, viva-voce |

| Course Curated by | | |
|---|---|---|
| **Expert from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert** |
| Dr. Mahesh Veezhinathan<br>Director - Innovation Practicum<br>Associate VP - Forge.<br>Innovation | - | Dr. Samuel Ratna Kumar P S<br>Assistant Professor – III<br>Department Mechanical<br>Engineering |
| **Recommended by BoS on** | 17.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| 24HSP112 | HOLISTIC WELLNESS-II | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | (Common to all Department) | 0 | 0 | 2 | 0 | 1 |
| HS | | SDG | | 3, 4 | | |

| Pre-requisite courses | 24HSP111 / Holistic Wellness-I | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | build on the foundation laid in Holistic Wellness -I and deepening into the practices and principles of holistic wellness. |
|---|---|
| 2 | explore advanced techniques in mental, emotional, and spiritual well-being, with an emphasis on creating sustainable wellness habits. |

## Course Outcomes

| After successful completion of this course, the students shall be able to | | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|---|
| CO 1 | apply advanced techniques in mindfulness, meditation, and stress management. | Ap |
| CO 2 | understand the role of community and social connections in wellness. | U |
| CO 3 | develop resilience and adaptability in maintaining wellness. | E |
| CO 4 | refine and sustain a personalized holistic wellness plan. | E |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO 1 | PSO 2 |
| 1 | | | | | | 2 | | 2 | | | | | |
| 2 | | | | | | 2 | | | | | | | |
| 3 | | | | | | 2 | | | | | 3 | | |
| 4 | | | | | | 2 | | | | | 3 | | |

## Course Content

| ADVANCED MINDFULLNESS AND MEDITATION:<br>• Deepening mindfulness practices for enhanced mental clarity.<br>• Exploring different forms of meditation (e.g., guided, transcendental, movement-based).<br>• Hands-on activity: Daily meditation practice and journaling reflections. | 6 Hours |
|---|---|
| EMOTIONAL RESILIENCE AND MENTAL HEALTH:<br>• Building emotional resilience through positive psychology practices.<br>• Cognitive-behavioural strategies for managing stress and anxiety.<br>• Hands-on activity: Developing and practicing a resilience toolkit. | 6 Hours |

| SOCIAL AND ENVIRONMENTAL WELLNESS: | |
|---|---|
| • The impact of social connections and community on wellness.<br>• Creating a supportive environment for personal growth.<br>• Hands-on activity: Building a community wellness project or group activity. | **6 Hours** |
| **INTERNAL GROWTH AND PURPOSE:** | |
| • Exploring the deeper aspects of internal wellness and self-actualization.<br>• Reflective practices for discovering life purpose and meaning.<br>• Hands-on activity: Creating a vision board or personal mission statement. | **6 Hours** |
| **SUSTAINING WELLNESS PRACTICES:** | |
| • Strategies for maintaining wellness habits over the long term.<br>• Adapting wellness plans to life changes and challenges.<br>• Hands-on activity: Revising and finalizing a long-term personal wellness plan. | **6 Hours** |

| Theory | | Tutorial | | Practical | | Project | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| **Hours:** | **0** | **Hours:** | **0** | **Hours:** | **30** | **Hours:** | | **Hours:** | **30** |

| Learning Resources |
|---|

| Textbooks: |
|---|

1. Hanh, Thich Nhat. The Miracle of Mindfulness: An Introduction to the Practice of Meditation. Beacon Press, Boston (1975).
2. Tolle, Eckhart. The Power of Now: A Guide to Spiritual Enlightenment. New World Library, Novato (1997).
3. Patel, Kamlesh. Heartfulness Way: Heart-Based Meditations for Spiritual Transformation, Kamlesh Patel, 2018.

| References: |
|---|

1. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
2. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
3. Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
4. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).
5. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
6. Lipton, Bruce., The Biology of Belief 10th Anniversary Edition: Unleashing the Power of Consciousness, Matter & Miracles, Hay House, Carlsbad (2015).
7. Kalderdon Adizes Ichak., What Matters in Life: Lessons I Learned from Opening My Heart
8. ., WS Press, Newtown, PA(2023).
9. Murphy, Joseph., The Power of Your Subconscious Mind [Original Edition (Complete)], Prentice-Hall, Englewood Cliffs (1963).
10. Kamlesh D. Patel., Designing Destiny: The Heartfulness Way, Heartfulness Institute, Chennai (2021)

| Online Resources (Weblinks) |
|---|

- Introduction to Psychology
- Guided Meditation
- Life skills and value education
- James Allen Library

| Assessment (Practical course) |
|---|
| Participation, Practical activities and assignments, personal wellness plan and reflection. |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| | | Dr. Ezhilarasi<br>Principal- KCT |
| **Recommended by BoS on** | | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| 24INP101 | DESIGN THINKING (Common to all Department) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 0 | 1 |
| ES | | SDG | | | 9 | |

| Pre-requisite courses | - | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | introduces first-year engineering students to Design Thinking, focusing on practical, user-centered problem-solving techniques |
|---|---|
| 2 | empathize with users, generate ideas, and create models to test and refine their solutions |
| 3 | understand iteration, empathy, and critical reflection to cultivate a creative mindset |

## Course Outcomes

| After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|
| CO 1 | apply problem-solving techniques and the Design Thinking process to engineering problems using simple models | Ap |
| CO 2 | understand user needs through various empathy techniques and develop/refine models iteratively based on user insights. | U |
| CO 3 | reflect critically on their learning journeys and the emotional demands of problem-solving. Collaborate effectively in teams to develop innovative solutions | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO 1 | PSO 2 |
| 1 | 1 | | 2 | | | 2 | | 2 | | | 1 | | |
| 2 | 1 | | | | | | | 2 | | | 1 | | |
| 3 | 1 | | 2 | | | 2 | | 1 | | | 1 | | |

## Course Content

| **Introduction to Problem Solving and Ground Rules** Introduction to problem-solving strategies without mentioning Design Thinking-Emphasize problem-solving attitudes, mindsets, and behaviours necessary for iterative problem solving (e.g., openness to failure, patience, empathy)-Set ground rules for the course, including incentives for creative risk-taking and penalties for non-participation or lack of reflection-Overview of the Design Thinking process and its importance. | **6 Hours** |
|---|---|

| | |
|---|---|
| **Empathy and Problem Definition**<br>Techniques for understanding user needs, including observation, interviews, **surveys** and **focus groups-**Importance of secondary research as a complement for the above-mentioned methods-Introduction to empathy cycles: involve students in two empathy cycles before and after problem definition-Finetuning problem definition based on user insights. | **6 Hours** |
| **Ideation and Concept Modelling**<br>Brainstorming ideas and selecting feasible solution-Creating concept modelling to visualize ideas-Include an empathy cycle after students propose solutions, allowing them to revisit and reshape their solutions based on further insights from users. | **6 Hours** |
| **Prototyping and Testing with Models**<br>Building basic prototypes using simple materials (e.g., cardboard, clay)- Introduction to different prototyping methods (e.g., **low-fidelity** vs **high-fidelity models**) for different contexts: product design, space design, policy, and digital/e-commerce solutions-Conduct an empathy cycle after the prototype is developed to gather user feedback and refine the prototype. | **6 Hours** |
| **Iteration and Final Modelling Project**<br>Students refine their prototypes based on feedback from the empathy cycle-Finalize prototypes for presentation based on consistent feedback loops. | **6 Hours** |
| **Presentation, Reflection, and Learning Summaries**<br>Students present their final projects and reflect on their learning journeys, including how their understanding of problem-solving and empathy evolved during the course-**Learning Summary Activity:** Each student presents their individual journey and learning outcomes from the empathy cycles and iterations-Peer review and group discussions. | **6 Hours** |

| Theory<br>Hours: | 0 | Tutorial<br>Hours: | 0 | Practical<br>Hours: | 30 | Project<br>Hours: | 0 | Total<br>Hours: | 30 |
|---|---|---|---|---|---|---|---|---|---|

## Learning Resources

### Textbooks:

1. Handbook of Design Thinking, Christian Muller – Roterberg, Kindly Direct Publishing
2. The Art of Innovation, Tom Kalley
3. **E Balaguruswamy (2022), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company**

### Online Resources (Weblinks)

1. Survey and focus group design guides
2. Guidance on Designing, Administering and Analyzing Focus Groups and Interviews
3. Empathy mapping tools
4. How to Make a Concept Model
5. Brainstorming Techniques: 15 Creative Activities
6. 10 Brainstorming Techniques for Developing New Ideas
7. Brainstorming templates
8. 5 Common Low-Fidelity Prototypes and Their Best Practices
9. UX Prototypes: Low Fidelity vs. High Fidelity
10. Low-fidelity vs. High-fidelity Design Prototypes (and when to use which)
    Case study 1: Iterative Design and Prototype Testing of the NN/g Homepage
    Case study 2: Using iterative design to optimise the user flow of a product
11. Reflective practice toolkit

## Assessment

Formative: Assignments, Mini project

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institutions** | **Internal Expert(s)** |
| | | Dr. Padhmanand Sudhagar R<br>Department of Bio-Tech<br>Dr. Arul H<br>Department of Physics |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No: 27 | **Date** 24.08.2024 |

| 24CSV002 | **DISRUPTIVE TECHNOLOGIES** | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | (Common to AD, CS, IT) | 2 | 0 | 0 | 0 | 0 |
| **VA** | | SDG | | | 4, 8, 9 | |

| **Pre-requisite courses** | - | **Data Book / Code book (If any)** | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | introduces various emerging technologies to enable the students to stay relevant and to thrive towards domain. Students will gain insights into innovation and technopreneurship, learning how to identify opportunities and bring technological solutions to market. |
|---|---|

## Course Outcomes

| After successful completion of this course, the students shall be able to | **Revised Bloom's Taxonomy Levels (RBT)** |
|---|---|
| CO 1 | understand the emergence of cutting-edge technologies and their impact on the businesses. | U |
| CO 2 | understand the evolution of techno entrepreneurial ecosystems | U |
| CO 3 | relate the ways in which the disruptive technologies play a pivotal role in solving contemporary and futuristic real-world operations. | R |

| Course Outcomes (CO) | **Program Outcomes (PO)** (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning |
| 1 | 2 | | | | | | | 2 | 3 | | 2 |
| 2 | 2 | | | | | | | 2 | 3 | | 2 |
| 3 | 1 | | | | | | | 2 | 3 | | 2 |

## Course Content

| **DATA SCIENCE, ANALYTICS AND VISUALIZATION**<br>Data as the new oil - Data-Driven Innovation- Big Data Technologies – Data Analysis vs Data Analytics – Data Visualization – Decision making through Data - Ethical and Privacy Challenges - Trends – opportunities – skills. | **3 Hours** |
|---|---|
| **AUTOMATION AND ARTIFICIAL INTELLIGENCE**<br>Information Systems – ERP – CRM – Robotic Process Automation - AI basics - Machine Learning - Neural networks - Deep Learning - Natural Language Processing - Computer Vision - Generative Adversarial Networks (GANs) – Robotics – Ethical AI and Regulatory Considerations - Global Investments – Sustainability - Trends – opportunities – skills. | **3 Hours** |
| **INTERNET OF THINGS AND UNMANNED ARIAL VEHICLES**<br>Characteristics of IoT – Physical Design of IoT - Logical Design of IoT – Enabling Technologies – IoT Components – IoT Prototyping – IoT Devices – Applications: Home | **3 Hours** |

| | |
|---|---|
| Automation – Industry 4.0 - Smart Cities - Unmanned Aerial Vehicles & types - UAV Technologies: Urban Air Mobility (UAM), Vertically Integrated Drones, Drone Swarms - Counter-Drone Technology- Energy Efficiency and Sustainability - Trends – Opportunities – Skills. | |
| **CLOUD AND EDGE COMPUTING**<br>Cloud models – Cloud applications - storage, Collaborative documents, presentations, spreadsheets – SAAS – PAAS – IAAS -Benefits of cloud – Challenges in cloud computing – Edge Computing – Forms of Edge Computing – EDGE VS Cloud - Trends – opportunities – skills. | **3 Hours** |
| **EXTENDED REALITY**<br>Basics of XR - XR Landscape - Intro to AR-VR-MR Concepts – Metaverse - MR Strategy & Remote Collaboration – Spatial computing - Challenges and Ethical Considerations – Skills - Trends – opportunities. | **4 Hours** |
| **NETWORKING & DISTRIBUTED COMPUTING**<br>Layered Architecture – Networking tools – 5G and Beyond – Software Defined Networks – Network Monitoring and analysis – Distributed Computing – Distributed Sensor Networks – Blockchain fundamentals – DAO - Trends – opportunities – skills. | **3 Hours** |
| **WEB AND SOFTWARE DEVELOPMENT**<br>Web Technologies - Web 3.0 – Need for Software Engineering – Full stack development – Mobile application development – front end - backend - Meta Developer Circles & forums - Cross-platform application development – UI & UX - Open-Source development – Responsive Web Design - Trends – opportunities – skills. | **3 Hours** |
| **CYBERSECURITY**<br>Fundamentals - Security goals, mechanisms and Services – Cyber Defence – Offensive Cyber Security - Cyber forensics – Malware Analysis – Threat Intelligence - Threat Hunting - Security technologies - Cyber warfare – Cyber Physical System – Trends – opportunities – skills.  User behaviour analysis. | **4 Hours** |
| **INNOVATION AND TECHNOPRENEURSHIP**<br>Innovation and Creativity - Entrepreneurial Mindset - Identifying Opportunities - Business Planning - Product Development and Innovation - Technology Commercialization - Marketing and Branding - Entrepreneurial Leadership - Entrepreneurial Ecosystems - Trends – opportunities – skills. | **4 Hours** |

| Theory | Tutorial | Practical | Project | Total |
|---|---|---|---|---|
| **Hours:  30** | **Hours:** | **Hours:** | **Hours:** | **Hours:  30** |

**Learning Resources**
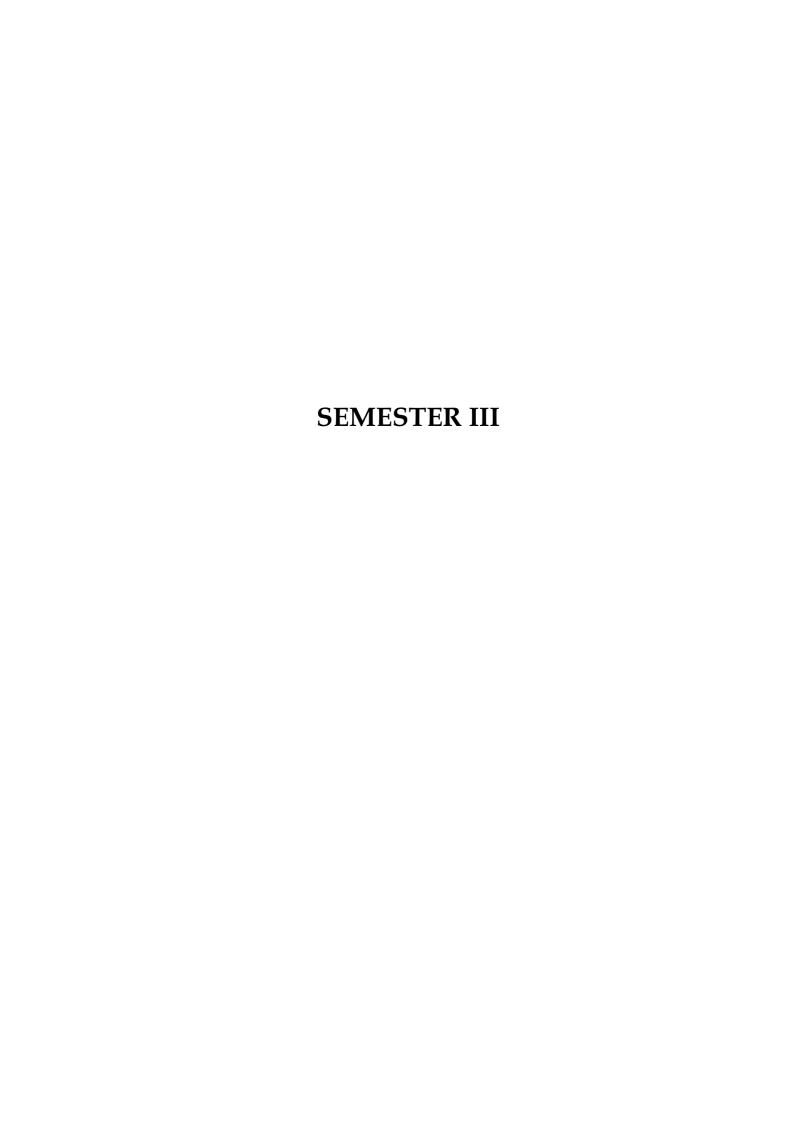
**Textbooks**

1. Davy Cielen, Arno D B Meysman, Mohamed Ali, "Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools", 2016.
2. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Fourth edition, 2020.
3. Höller, J., Tsiatsis, V., Mulligan, C., Karnouskos, S., Avesand, S., & Boyle, D., " From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", Springer, 2019.
4. Daniel Tal and John Altschuld, "Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation", 2021 John Wiley & Sons, Inc
5. A. B. Lawal, "Cloud Computing Fundamentals: Learn the Latest Cloud Technology and Architecture with Real-World Examples and Applications", A. B. Lawal publication, 2020.
6. Ralf Doerner,  Wolfgang Broll, Paul Grimm,  Bernhard Jung," Virtual and Augmented Reality (VR/AR),Foundations and Methods of Extended Realities (XR)"Springer Cham
7. Andrew S Tanenaum, David Wetherall, "Computer Networks", Pearson Prentice Hall, Fifth edition, 2011.
8. Joseph J. Bambara, Paul R. Allen, Kedar Iyer, Rene Madsen, Solomon Lederer, Michael Wuehler, "Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions", McGraw-Hill, 2018.

9. Nico Loubser , "Software Engineering for Absolute Beginners: Your Guide to Creating Software Products", First edition, 2021.
10. William Stallings, "Cryptography and Network Security – Principles and Practices", Pearson Education; Seventh edition, 2017.
11. Pankaj Goyal, "Before You Start Up : How to Prepare to Make Your Startup Dream a Reality", Fingerprint Publishing, 2017.

| Assessment | |
|---|---|
| Formative | Summative |
| MCQS (10 questions) on every cohort in Coursera / Poster Presentation. | Nil |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| | | Dr. N. Jeba, Department of Computer Science Engineering |
| **Recommended by BoS on** | 16.8.2024 | |

| **Academic Council Approval** | No:27 | **Date** | 24.08.2024 |
|---|---|---|---|

# SEMESTER III

| 24CSI104 | DATA STRUCTURES AND ALGORITHMS (Common to AD, CS, IT) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 |
| ES | | SDG | | | 9 | |

| Pre-requisite courses | | Data Book / Code book (If any) | - |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | gain a comprehensive understanding of core data structures (arrays, lists, stacks, queues, trees, graphs) and algorithms, and how they are applied in solving computational problems. |
|---|---|
| 2 | develop the ability to analyze and evaluate the time and space complexity of algorithms using notations such as Big O, Big Theta, and Big Omega, helping in making optimal algorithmic choices for different applications. |
| 3 | acquire hands-on skills to implement and manipulate linear and non-linear data structures (linked lists, binary trees, heaps, hash tables) for real-world software development scenarios, improving program efficiency and memory management. |

## Course Outcomes

| After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|
| CO 1 — understand various data structures and their application as tools for effective problem-solving. | U |
| CO 2 — identify appropriate linear and non-linear data structures to solve specific computational challenges. | Ap |
| CO 3 — analyze the efficiency and effectiveness of different algorithms by examining time and space complexities and evaluate their performance in solving problems. | An |
| CO 4 — develop programs that employ suitable data structures, individually or in combination, to create efficient solutions for complex challenges. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO-1 | PSO-2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 2 | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | 3 | |
| 3 | | | 3 | | | | | | | | | 3 | |
| 4 | | 3 | | | | | | | | | | 3 | |

## Course Content

| INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS | 6 Hours |
|---|---|
| Introduction to Data Structures and Algorithms, Importance of data structures in programming and software development, data types vs data structures, Abstract Data Types (ADTs), Algorithm analysis: Big O, Big Theta, Big Omega notations | |

| | |
|---|---|
| **Practical Component**<br>Implementation of List ADT using arrays | **4 Hours** |
| **LINEAR DATA STRUCTURES**<br>Lists: unordered and ordered lists, insertion, deletion and display operations, Stacks: Implementation, Applications in expression evaluation, Queues: Implementation, Variants (Circular Queue, Priority Queue), Applications, Dynamic Memory Implementation: Linked Lists, stack, queue and queues (Single, Double, and Circular linked implementation). | **12 Hours** |
| **Practical Component**<br>Implement the applications of Linear Data structures | **8 Hours** |
| **NON-LINEAR DATA STRUCTURES**<br>Trees: Binary Trees, Binary Search Trees, AVL Trees, Tree Traversal Algorithms: Inorder, Preorder, Postorder. Heap - Binary Heap, Complete Binary Tree, Tree Representation of Binary Heap, Max Binary Heap, Min Binary Heap, Insertion and Deletion in Binary Heap. Graphs: Terminologies, Representation (Adjacency Matrix, List), Graph Traversal (BFS, DFS), Spanning Trees, Shortest Path Algorithms (Dijkstra, Floyd-Warshall). | **12 Hours** |
| **Practical Component**<br>Implement the applications of Non-Linear Data structures | **8 Hours** |
| **SORTING AND SEARCHING ALGORITHMS**<br>Sorting Algorithms: Bubble Sort, Selection sort, insertion sort, Merge Sort, Quick Sort, Heap Sort, Searching Algorithms: Linear Search, Binary Search, Jump search, Exponential search and Interpolation search. | **12 Hours** |
| **Practical Component**<br>Implement the Sorting and searching Algorithms | **8 Hours** |
| **HASHING TECHNIQUES**<br>Hashing: Hash Functions, Collision Resolution Techniques, Linear probing, Quadratic probing, random probing, Double hashing and rehashing, Hashing Applications.<br>Memory Management: Garbage Collection | **3 Hours** |
| **Practical Component**<br>Implementation of Hash Table | **2 Hours** |

| Theory | Tutorial | Practical | Project | Total |
|---|---|---|---|---|
| Hours: 45 | Hours: 0 | Hours: 30 | Hours: 0 | Hours: 75 |

| Learning Resources |
|---|
| **Textbooks** |
| 1. Horowitz, Ellis, Sartaj Sahni, and Susan Anderson-Freed. Fundamentals of Data Structures in C. Universities Press, Hyderabad (2021).<br>2. Tenenbaum, Aaron M., Yedidyah Langsam, and Moshe J. Augenstein. Data Structures Using C. Pearson, New York (2021).<br>3. Weiss, Mark Allen. Data Structures Using C. Pearson Education Asia, Singapore (2007). |
| **Reference books** |
| 1. Tremblay, Jean Paul, and Paul G. Sorenson. An Introduction to Data Structures with Applications. Tata McGraw-Hill, New Delhi (2014).<br>2. Mehlhorn, Kurt, and Peter Sanders. Algorithms and Data Structures: The Basic Toolbox. Springer, Berlin (2011).<br>3. Aho, Alfred V., John E. Hopcroft, and Jeffrey D. Ullman. Data Structures & Algorithms. Pearson Education, New Delhi (2009). |
| **Online Resources (Weblinks)** |
| 1. https://open.umn.edu/opentextbooks/textbooks/an-open-guide-to-data-structures-and-algorithms<br>2. https://www.oreilly.com/library/view/data-structures-and/9780133437483/<br>3. https://www.khanacademy.org/computing/computer-science/algorithms |

4.  https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/
5.  https://www.geeksforgeeks.org/data-structures/

**Assessment (Embedded course)**

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

**Course Curated by**

| Expert(s) from Industry | Expert(s) from Higher Education Institution | Internal Expert(s) |
|---|---|---|
| | | Dr. S. Kavitha, Department of Information Technology |
| **Recommended by BoS on** | 16.08.2024 | |
| **Academic Council Approval** | No:27 | **Date** 24.08.2024 |

| 24CSI008 | **OBJECT ORIENTED PROGRAMMING** | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 4 | |
| **ES** | (Common to AD, CS, IT) | SDG | 9 | | | |

| **Pre-requisite courses** | **Nil** | **Data Book / Codes / Standards ( If any)** | **Nil** |
|---|---|---|---|

| **Course Objectives:** | **The purpose of taking this course is to:** |
|---|---|
| 1 | Understand the basic principles and features of object-oriented programming using C++. |
| 2 | Explore the use of classes, objects, constructors, destructors, and various forms of inheritance |
| 3 | Apply the concepts of function overloading, operator overloading, and polymorphism |
| 4 | Use pointers and virtual functions to implement dynamic behaviour in programs. |
| 5 | Implement exception handling and generic programming using C++. |

| **Course Outcomes:** | **After successful completion of this course, the students shall be able to** | **Bloom's Taxonomy Level (BTL)** |
|---|---|---|
| CO 1 | Explain the basic principles of OOP and structure of C++ programs. | U |
| CO 2 | Illustrate the use of classes, objects, and access control in program design. | U |
| CO 3 | Apply constructors, destructors, and various inheritance types in solving real-world problems. | Ap |
| CO 4 | Demonstrate function overloading, operator overloading, and polymorphism using pointers. | Ap |
| CO 5 | Implement exception handling and generic programming using C++ templates and Standard Template Library. | Ap |

| Course Outcomes (CO) | **Program Outcomes (PO)** (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | **Program Specific Outcomes (PSO)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO-1 | PSO-2 |
| 1 | 3 | 2 | | | | | | | | | | 3 | |
| 2 | 2 | | | 3 | | | | | | | | 3 | |
| 3 | | 2 | | 3 | | | | | | | | 3 | |
| 4 | 2 | | | 3 | | | | | | | | 3 | |
| 5 | | | 3 | 3 | | | | | | | | 3 | |

| **Course Content** |
|---|

| **PRINCIPLES OF OOP AND INTRODUCTION TO C++** Basic concepts of Object-Oriented Programming-Benefits and Applications of OOP- Structure of a C++ program-Tokens, Keywords, Identifiers, Basic Data Types-Input and Output in C++ -Type Conversion- Operators -Control Structures | **9 Hours** |
|---|---|
| | **6 Hours** |

| | |
|---|---|
| **Practical Component**<br>Simple C++ programs to demonstrate control flow, arithmetic operations, and console I/O | |
| **CLASSES AND OBJECTS**<br>Defining a Class, Creating Objects -Member Functions, Access Specifiers -Scope Resolution Operator, Nesting of Member Functions-Memory Allocation for Objects-Static Members, Array of Objects-Passing Objects as Arguments, Returning Objects | **9 Hours** |
| **Practical Component**<br>Programs on class and object creation, object arrays, and member access | **6 Hours** |
| **CONSTRUCTORS AND INHERITANCE**<br>Constructors- Default, Parameterized, Copy Constructor , Destructors -Inline Functions, Default Arguments- Inheritance: Types -Single, Multilevel, Multiple, Hierarchical-Friend Functions- Abstract Classes | **9 Hours** |
| **Practical Component**<br>Demonstrate all types of inheritance along with constructors using C++ | **6 Hours** |
| **POLYMORPHISM AND POINTERS**<br>Function Overloading-Operator Overloading- Unary, Binary-Rules for Overloading-constructor overloading- Pointers to Objects, this Pointer-Virtual Functions, Runtime Polymorphism | **9 Hours** |
| **Practical Component**<br>Programs to demonstrate compile time and runtime polymorphism along with pointers | **6 Hours** |
| **EXCEPTION HANDLING ,FILES AND GENERIC PROGRAMMING**<br>Introduction to exceptions and error types-Syntax and semantics of try, catch, throw-Multiple catch blocks and generic catch-Nested try blocks and rethrowing exceptions Handling uncaught exceptions - File Streams and Their Types - Reading and Writing Data to Files-Function Templates- Class Templates-Standard Template Library. | **9 Hours** |
| **Practical Component**<br>Programs on handling exceptions using try-catch, throw, rethrow; implementing function and class templates using STL containers and algorithms like sort and find- File handling using ifstream, ofstream, fstream – Reading/writing text data, | **6 Hours** |

| Theory Hours: | 45 | Tutorial Hours: | | Practical Hours: | 30 | Project Hours: | | Total Hours: | 75 |
|---|---|---|---|---|---|---|---|---|---|

| **Learning Resources*** |
|---|
| **Textbooks** |
|    3.   E. Balagurusamy, Object Oriented Programming with C++, 8th Edition, McGraw Hill Education, 2021.<br>   4.   Robert Lafore, Object-Oriented Programming in C++, 4th Edition, Sams Publishing, 2002 |
| **Reference books/ Web Links** |
|    7.   Bjarne Stroustrup, *The C++ Programming Language*, 4th Edition, Addison-Wesley, 2013.<br>   8.   Herbert Schildt, *C++: The Complete Reference*, 4th Edition, McGraw-Hill Education, 2003.<br>   9.   Joyce Farrell, *Object-Oriented Programming Using C++*, 4th Edition, Cengage Learning, 2008. |
| **Online Resources** |
|    6.   https://www.programiz.com/cpp-programming<br>   7.   https://www.geeksforgeeks.org/c-plus-plus/<br>   8.   https://cplusplus.com/doc/tutorial/<br>   9.   https://www.tutorialspoint.com/cplusplus/ |

| **Assessment (Embedded course)** |
|---|
| CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)<br>Lab Workbook, Experimental Cycle tests, viva-voce |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert** |
| - | - | Ms. R. Nivetha Department of Computer Science and Engineering |
| **Recommended by BoS on** | 09.05.2025 | |
| **Academic Council Approval** | No: 28 | **Date** 26.06.2025 |

| 24CSI009 | DATABASE MANAGEMENT SYSTEMS (Common to AD, CS, IT) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 4 | |
| PC | | 3 | 0 | 2 | | 4 |
| | | SDG | | 9 | | |

| Pre-requisite courses | Nil | | Data Book / Codes / Standards (If any) | Nil |
|---|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | Acquire knowledge of fundamental database concepts, data models, and database system architecture. |
|---|---|
| 2 | Develop practical skills in designing relational databases using Entity-Relationship modelling and normalization techniques. |
| 3 | Gain competency in using Structured Query Language for data definition, data manipulation, and complex data retrieval. |
| 4 | Understand the principles of query processing, optimization, transaction management, and concurrency control in database systems. |
| 5 | Develop the ability to analyze database design choices and query strategies for performance, integrity, and compare relational databases with NoSQL alternatives. |

## Course Outcomes

| After successful completion of this course, the students shall be able to | | Bloom's Taxonomy Level (BTL) |
|---|---|---|
| CO 1 | Apply relational database concepts to define structures and manage data effectively. | Ap |
| CO 2 | Design and normalize relational database schemas using Entity-Relationship modelling and normalization techniques to ensure data integrity. | Ap |
| CO 3 | Implement relational operations and join strategies using relational algebra and SQL to retrieve and combine data efficiently. | Ap |
| CO 4 | Analyze transaction processing concepts, concurrency issues, and recovery techniques to ensure the consistency and correctness of database systems. | An |
| CO 5 | Apply CRUD operations in NoSQL databases to manage semi-structured and unstructured data effectively. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO-1 | PSO-2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 2 | | | | 3 | | | | | | | | 2 |
| 2 | | 2 | | | 3 | | | | | | | 3 | |
| 3 | 2 | | 3 | | | | | | | | | | 2 |
| 4 | | 3 | | 2 | | | | | | | | 2 | 3 |
| 5 | | 3 | 2 | | | | | | | | | 2 | |

## Course Content

| Content | Hours |
|---|---|
| **INTRODUCTION TO DATABASES AND DATA MODELLING**<br>**Evolution from File Systems to DBMS – Advantages of Using DBMS approach - Types of Data - Data Models - DB Architecture and users - Relational** Model Concepts - Attributes, Tuples, Relations and Constraints -Differences between OLAP and OLTP- Introduction to SQL: DDL, DML, Data Types, Constraints and Aggregate Functions.<br><br>**Practical Component**<br>Creation of a database and writing SQL queries to retrieve information from the database - Exploring the use of WHERE, ORDER BY, and limit clauses in SQL - Implement Aggregate Functions. | **9 Hours**<br><br><br><br><br>**6 Hours** |
| **RELATIONAL MODELLING AND DATABASE DESIGN**<br>Logical Database Design: Different approaches in Logical design, ER Modeling, ER notations - Steps in ER modeling. Physical database design: Converting ER Model to Relational Database Design, Normalization -Functional Dependency, 1NF, 2NF, 3NF, Boyce-Codd Normal Form (BCNF) - Decomposition properties.<br><br>**Practical Component:**<br>Implementation of ER Diagram and identifying its entities, relations, attributes and constraints – Converting the ER diagram into relational schema – Convert a relation to 1NF, 2NF, 3NF and BCNF. | **9 Hours**<br><br><br><br><br>**6 Hours** |
| **PHYSICAL DATABASE DESIGN AND QUERY PROCESSING**<br>Overview of File Organization – RAID concepts - Indexing: Single, Multilevel – Dynamic - B+-tree indexing – Hashing Techniques – Static and Dynamic Hashing – Relational Algebra – Translating SQL Queries into Relational Algebra – Joins – Query Optimization: Join Query Optimization – Query Optimization Rules – Tuple Relational Calculus.<br><br>**Practical Component:**<br>Simulation of relational Algebra operations – Performing joins using Relational Algebra – Implementation of various SQL joins. | **9 Hours**<br><br><br><br><br>**6 Hours** |
| **TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL**<br>Transaction Concepts - ACID Properties - Transaction States – Transaction control Commands - Serializability Concepts - Recovery Mechanisms: Undo/Redo, Shadow Paging, Log Based Recovery - Concurrency Control: Locking Protocols, Timestamp Protocols, Deadlock Handling.<br><br>**Practical Component:**<br>Implement multiple transactions using SQL involving BEGIN, COMMIT & ROLLBACK – Write SQL Queries for Nested Transactions. | **9 Hours**<br><br><br><br><br>**6 Hours** |
| **NOSQL DATABASE MANAGEMENT**<br>Introduction to NoSQL Databases – Key Features and Principles of NoSQL – CAP Theorem – Classification of NoSQL Databases- Querying in NoSQL Systems: CRUD operations – NoSQL Query Language Overview<br><br>**Practical Component:**<br>Creation of Database and Performing CRUD operations in NoSQL – Querying with NoSQL databases. | **9 Hours**<br><br><br><br>**6 Hours** |

| Theory | Tutorial | Practical | Project | Total |
|---|---|---|---|---|
| **Hours: 45** | **Hours: 0** | **Hours: 30** | **Hours: 0** | **Hours: 75** |

## Learning Resources

### Textbooks

1. Silberschatz, Abraham, Henry F. Korth, and S. Sudarshan. Database System Concepts. 7th Edition, McGraw Hill, 2019.
2. Elmasri, Ramez, and Shamkant B. Navathe. Fundamentals of Database Systems. 7th Edition, Pearson, 2017.

### Reference books/ Web Links

1. Ramakrishnan, Raghu, and Johannes Gehrke. Database Management Systems. 3rd Edition, McGraw Hill, 2003.
2. Sadalage, Pramod J., and Martin Fowler. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. Addison-Wesley Professional, 2012.

### Online Resources

1. https://onlinecourses.nptel.ac.in/noc24_cs12/preview
2. https://online.stanford.edu/courses/soe-ydatabases0005-databases-relational-databases-and-sql
3. https://www.w3schools.com/sql/
4. https://mode.com/sql-tutorial/
5. https://www.scaler.com/topics/course/dbms/

## Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

## Course Curated by

| Expert(s) from Industry | Expert(s) from Higher Education Institution | Internal Expert |
|---|---|---|
| - | - | Mr. K. Manoj, Department of Computer Science and Engineering |
| **Recommended by BoS on** | 09.05.2025 | |

| **Academic Council Approval** | No: 28 | **Date** | 26.06.2025 |
|---|---|---|---|

| 24ADI001 | ARTIFICIAL INTELLIGENCE AND AUTOMATION | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 |
| PC | (Common to AD, CS, IT) | SDG | | 8,9 | | |

| Pre-requisite courses | Nil | Data Book / Codes / Standards (If any) | Nil |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | Understand the fundamentals of AI and its potential for decision making. |
|---|---|
| 2 | Introduce the concept of artificial intelligence, methods, techniques and applications |
| 3 | Gain practical experience through case studies and hands-on projects. |

## Course Outcomes

| | After successful completion of this course, the students shall be able to | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|---|
| CO1 | Apply the foundational concepts of AI, including intelligent agents, predicate logic, and knowledge representation techniques, to perform logical reasoning. | Ap |
| CO2 | Analyze and implement classical and heuristic search algorithms to solve complex AI problems. | An |
| CO3 | Apply probabilistic reasoning techniques to represent and infer knowledge under uncertainty in AI systems. | Ap |
| CO4 | Analyze decision-making models to optimize AI-driven strategic and sequential decision-making under uncertainty. | An |
| CO5 | Design and implement AI-driven automation systems and workflows using appropriate tools to streamline tasks and enhance operational efficiency across diverse domains. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO-1 | PSO-2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 3 | | | | | | | | | | 2 | 3 | |
| 2 | | 3 | | | | | | | | | 2 | 3 | |
| 3 | 3 | | | | 2 | | | | | | 2 | 3 | |
| 4 | | 3 | | | 2 | | | | | | | 3 | |
| 5 | | | 2 | | 3 | | | | | | | 2 | |

## Course Content

| INTRODUCTION TO AI | 9 Hours |
|---|---|
| Fundamentals of AI - Definitions, Key concepts, Intelligent agents, Agents and Environment. Propositional Logic – Agents based on Propositional Logic – First order | |

| | |
|---|---|
| logic – Syntax and semantics – Knowledge Engineering in First Order Logic– Inference – Unification - Forward and backward chaining - Resolution. | **6 Hours** |
| **Practical Component**<br>Intelligent Agent Simulation - Propositional Logic and Knowledge-Based Agent - First Order Logic and Inference (Chaining and Resolution) | |
| **PROBLEM SOLVING**<br>State space search; production systems, search space control; depth first search, breadth-first search. Heuristic Based Search: Hill climbing, best-first search, A*Algorithm and AO* algorithm, Min-max algorithms, game playing – Alpha beta pruning branch and bound, Problem Reduction, Constraint Satisfaction. | **9 Hours** |
| **Practical Component**<br>Implement AI search algorithms such as BFS, DFS, A* and AO* - Develop an AI for Tic-Tac-Toe or Chess using heuristic-based decision-making - Implement a Sudoku solver or a N-Queens problem solver using backtracking and constraint satisfaction techniques. | **6 Hours** |
| **REPRESENTING AND REASONING WITH UNCERTAIN KNOWLEDGE**<br>Handling uncertainty in AI, Probability theory and its connection to logic, Concepts of independence and conditional probability, Structure of Bayesian Networks, Bayesian rule and its applications, Markov Models and Hidden Markov Models (HMMs), Probabilistic graphical models and Inference algorithms. | **9 Hours** |
| **Practical Component**<br>Build and evaluate a Bayesian Network for a real-world problem - Implement Hidden Markov Models (HMM) for sequence prediction tasks | **6 Hours** |
| **DECISION-MAKING**<br>Importance of decision making in AI, Utility, preferences and Expected utility in decision-making under uncertainty, Decision Theory Basics, Markov Decision Processes (MDPs), Game theory and strategic decision-making in AI. | **9 Hours** |
| **Practical Component**<br>Implement a simple MDP for decision-making in a dynamic environment - Develop a game-theoretic model for AI-based strategic decision-making | **6 Hours** |
| **ARTIFICIAL INTELLIGENCE FOR AUTOMATION**<br>Understanding Automation, Applications of AI-driven Automation, Opportunities and challenges in AI automation. Automation in production systems-Automation principles and strategies-Basic elements of an automated system.<br>Introduction to Robotic Process Automation- Benefits of RPA, Components of RPA-RPA Platforms-About Ui Path. | **9 Hours** |
| **Practical Component**<br>Downloading and installing UiPath Studio - Explore Robotic Process Automation (RPA) tools like UiPath or Automation anywhere - Create a basic automation to extract information from a document and store it in a spreadsheet. | **6 Hours** |

| Theory<br>Hours:45 | Tutorial<br>Hours:0 | Practical<br>Hours: 30 | Project<br>Hours:0 | Total<br>Hours:75 |
|---|---|---|---|---|

| Learning Resources |
|---|

| Textbooks |
|---|

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 4th Edition, Pearson Education / Prentice Hall of India (2022).
2. Tom Taulli, "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress Publications (2020).

## Reference

1. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Sixth Edition, Pearson Education (2011).
2. Rich E., Knight K. and Nair B. S., Artificial Intelligence, Tata McGraw Hills,Third Edition (2009).
3. Alok Mani Tripathi, "Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool – UiPath", Packt Publishing (2018).

## Online Resources (Weblinks)

1. https://onlinecourses.nptel.ac.in/noc22_cs56
2. https://www.coursera.org/specializations/roboticprocessautomation

## Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

## Course Curated By

| Expert(s) from Industry | Expert(s) from Higher Education Institutions | Internal Expert(s) |
|---|---|---|
| - | - | Dr Chandrakala D Professor/Department of Artificial Intelligence and Data Science |
| **Recommended by BoS on** | 09.05.2025 | |

| **Academic Council Approval** | No: 28 | **Date** | 26.06.2025 |
|---|---|---|---|

| 24ITT012 | **APTITUDE AND REASONING -I** <br> **(Common to AD, CS, IT)** | **L** | **T** | **P** | **J** | **C** |
|---|---|---|---|---|---|---|
| | | 0 | 1 | 0 | 0 | 1 |
| **HS** | | **SDG** | | | 9 | |

| **Pre-requisite courses** | **Nil** | **Data Book / Codes / Standards ( If any)** | **Nil** |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | Equip with essential aptitude and reasoning skills commonly assessed in recruitment processes across various industries. |
|---|---|
| 2 | Develop proficiency in solving numerical problems related to arithmetic, percentages, ratios, time and work, and other job-relevant topics |
| 3 | Improve analytical thinking through practice with syllogisms, coding-decoding, blood relations, and logical sequences. |
| 4 | Train to answer questions accurately and efficiently under time constraints, as required in most job aptitude tests. |

## Course Outcomes:

| After successful completion of this course, the students shall be able to | Bloom's Taxonomy Level (BTL) |
|---|---|
| CO 1 | Apply fundamental arithmetic concepts to solve real-life and exam-based problems. | Ap |
| CO 2 | Solve time-based problems with logical approaches. | Ap |
| CO 3 | Demonstrate the ability to simplify and solve number system-related problems. | Ap |
| CO 4 | Use deductive reasoning in topics like direction sense, blood relations, and coding-decoding problems. | An |
| CO 5 | Interpret and analyze data sets presented in tables, bar charts, pie charts, and line graphs. | An |

| Course Outcomes (CO) | **Program Outcomes (PO)** (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | **Program Specific Outcomes (PSO)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO-1 | PSO-2 |
| 1 | 3 | | | | | | | | | | 3 | 1 | |
| 2 | 3 | | | | | | | | | | 3 | 1 | |
| 3 | 3 | | | | | | | | | | 3 | | |
| 4 | 3 | | 2 | | | | | | | | 3 | 2 | |
| 5 | 3 | | | | 2 | | | | | | 3 | 2 | |

| Course Content | |
|---|---|
| **RATIO AND PROPORTION, NUMBER SYSTEM**<br>Simple Equations, BODMAS rule, Basic proportional, Ratio and Proportions – Common factor multiplication types, Problems with Coins and Rupees, Problems with Income, Expenditure and Savings, Number System – Even and Odd Number Series, Numbers and its Digits, Arithmetic Operations on Number system | **3 Hours** |
| **AVERAGES AND PERCENTAGES, PROFIT AND LOSS**<br>Basic percentage calculations, Percentage increase/decrease, Successive percentage changes, Averages - Weighted average, Moving averages, Application-based problems, Profit and Loss- Cost price, selling price, and marked price, Profit and loss percentage, Successive discounts | **3 Hours** |
| **TIME AND WORK, PIPES AND CISTERNS**<br>Work Efficiency, Combined Work, Alternative Work, Efficiency and Time unknown Problems, Same Group of Members Working Together, Different Group of Members Working Together, Pipes and Cisterns – Filling Time Calculations, Tank Capacity Calculations | **3 Hours** |
| **BLOOD RELATIONS, CODING AND DECODING**<br>Family tree problems, Coded and complex relationships, Puzzle-based questions, Coding and Decoding – Single Word Coding, Two Word Coding, Number Coding, Letter and Number Coding, Symbol Coding | **3 Hours** |
| **SEATING ARRANGEMENTS, DIRECTION SENSE**<br>Linear Arrangements, Circular, Square and Rectangular (Facing centre and Facing Outward) Arrangements, Complex Arrangements, Cardinal directions, Angle and distance calculation, Shadow-based reasoning | **3 Hours** |

| Theory<br>Hours: 0 | Tutorial<br>Hours: 15 | Practical<br>Hours: 0 | Project<br>Hours: 0 | Total<br>Hours: 15 |
|---|---|---|---|---|

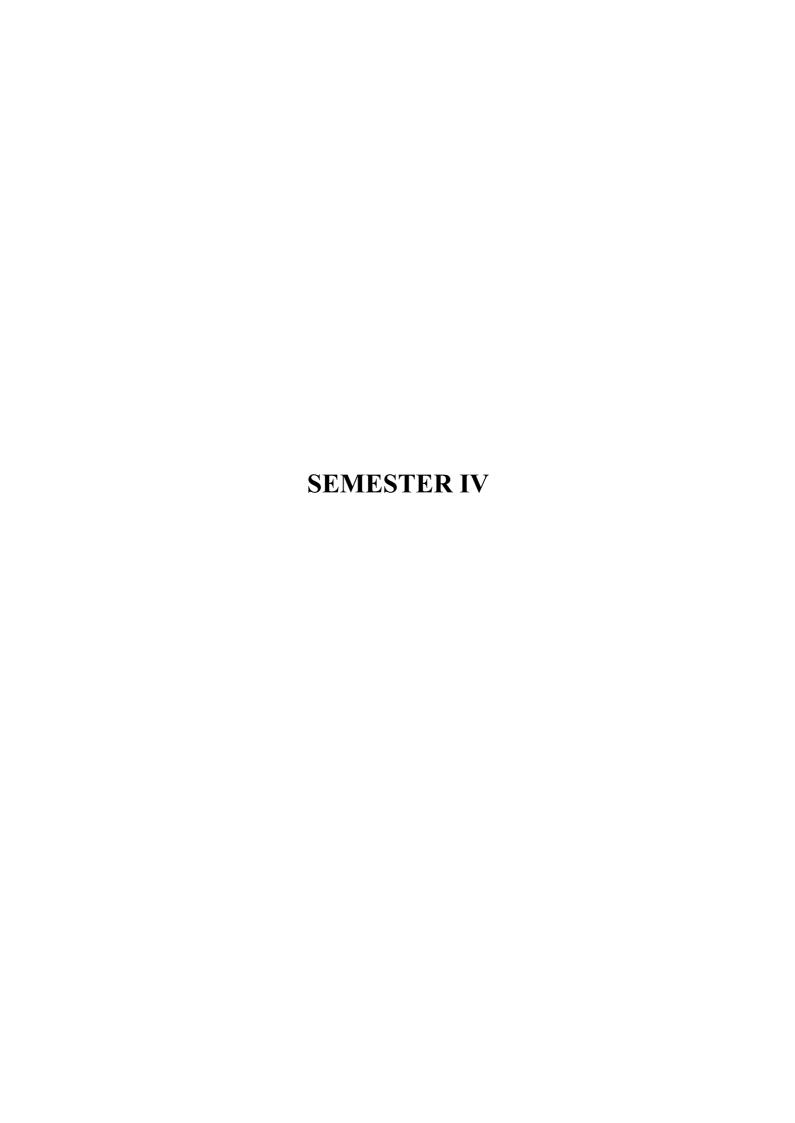| Learning Resources |
|---|
| **Textbooks** |
| 1. R.S. Agarwal, A Modern Approach to Logical Reasoning – comprehensive for verbal and non-verbal reasoning, S. Chand Publisher, (2022). |
| **Reference books/ Web Links** |
| 1. Arun Sharma, How to Prepare for Quantitative Aptitude for the CAT, McGraw Hill, (2021). |
| **Online Resources** |
| 1. https://crm.mastersacademy.in/ |

| Assessment |
|---|
| MCQ |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert** |
| Mr. Vivekanand,<br>CEO and Founder – Masters Academy | - | Dr. D. Sudharson,<br>Department of Artificial Intelligence and Data Science |
| **Recommended by BoS on** | 09.05.2025 | |
| **Academic Council Approval** | No: 28 | **Date** 26.06.2025 |

# SEMESTER IV

| 24ITT203 | COMPUTER ORGANIZATION AND ARCHITECTURE (Common to CS, IT) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 0 | 3 |
| PC | | SDG | | | 4,9 | |

| Pre-requisite courses | Nil | Data Book / Codes / Standards ( If any) | Nil |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | Introduce the basic structure and functional components of a computer system, including its evolution, Von Neumann architecture, and performance parameters. |
|---|---|
| 2 | Explain the internal organization of a basic computer, focusing on instruction formats, addressing modes, and the distinction between CISC and RISC architectures. |
| 3 | Explore arithmetic and logic unit (ALU) operations including integer and floating-point computations. |
| 4 | Examine memory hierarchy, cache, and I/O system designs and their impact on performance. |
| 5 | Explore modern advancements in computer architecture, including multicore processors, parallel architectures, and multiprocessor systems with interconnection structures and synchronization techniques. |

## Course Outcomes:

| After successful completion of this course, the students shall be able to | Bloom's Taxonomy Level (BTL) |
|---|---|
| CO 1 | Identify and explain the structure, functional units, performance characteristics of computer systems | U |
| CO 2 | Apply arithmetic algorithms to perform for addition, subtraction, multiplication, and division with correctness and efficiency in problem-solving tasks. | Ap |
| CO 3 | Apply the concepts of instruction execution, multiple bus organization, and control unit design to implement control logic using hardwired and microprogrammed approaches. | Ap |
| CO 4 | Explain the operations of I/O subsystems and memory architectures, and describe the roles of programmed I/O, interrupts, DMA, RAM, cache, and memory hierarchy in data transfer and system performance. | U |
| CO 5 | Utilize the principles of pipelining, hazard management, and parallel processing architectures such as superscalar, multicore, and GPU acceleration to improve performance in real-time computing systems. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO-1 | PSO-2 |
| 1 | 2 | 2 | | | | | | | | | | | |
| 2 | 2 | 2 | | | | | | | | | | | |
| 3 | 3 | | 2 | | | | | | | | | 2 | |
| 4 | 3 | 2 | | | | | | | | | | 2 | |
| 5 | 2 | 2 | | | | | | | | | | 1 | |

## Course Content

| FUNDAMENTALS OF COMPUTER ORGANIZATION | 7 Hours |
|---|---|
| Organization and Architecture- Structure and Function- Functional Units-Basic Operations and Concepts-Bus Structure-Performance. Memory Locations and Addresses - Memory Operations - Instruction and Instruction Sequencing - Addressing Modes - Basic I/O Operations. Case Study: Evolution of Intel, ARM Architectures/Processor Families | |
| **COMPUTER ARITHMETIC** | **11 Hours** |
| Addition and Subtraction of Signed Numbers-Design of Fast Adders-Multiplication of Positive Numbers-Signed Operand Multiplication-Fast Multiplication-Integer Division-Floating Point Numbers and Operation. | |
| **BASIC PROCESSING UNIT** | **9 Hours** |
| Fundamental Concepts - Execution of a Complete Instruction - Multiple Bus Organization - Hardwired Control – Microprogrammed Control – Microinstructions-Microprogram Sequencing-Wide Branch Addressing | |
| **I/O AND MEMORY** | **9 Hours** |
| The I/O Subsystem, -Programmed I/O- I/O Interrupts -Direct Memory Access (DMA) - The Components of Memory System – RAM Structure: The Logic Designer's Perspective – Memory Boards and Modules-Memory Hierarchy – The Cache- The Memory Subsystem. | |
| **PIPELING AND PARALLEL PROCESSING** | **9 Hours** |
| Basic Concepts - Data Hazards - Instruction Hazards – Influence on instruction sets - Data path and control considerations - Superscalar operation. Multiple Processor Organization-Types, Parallel Organization. Multicore Computers Introduction – Organization- Software and Hardware performance issues. Case Study: GPU Acceleration in Real-Time System. | |

| Theory | | Tutorial | | Practical | | Project | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| Hours: | 45 | Hours: | 0 | Hours: | 0 | Hours: | 0 | Hours: | 45 |

| Learning Resources |
| --- |
| **Textbooks** |
| 1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, 5th Edition, McGraw-Hill, (2014).
2. Vincent P Heuring, Harry F Jordan, TG Venkatesh., Computer Systems Design and Architecture, 2nd Edition, Pearson, (2014).
3. William Stallings, Computer Organization and Architecture - Designing for Performance, 9th Edition, Prentice Hall, (2012). |
| **Reference books/ Web Links** |
| 1. M. Moris Mano, Computer System Architecture, Revised 3$^{rd}$ Edition, Pearson, (2017).
2. John P.Hayes, Computer Architecture and Organization, 3$^{rd}$ Edition, McGraw Hill, (2002).
3. David A.Patterson and John L.Hennessy, Computer Organization and Design: The hardware / software interface, 5th Edition, Morgan Kaufmann, (2014).
4. Andrew S. Tanenbaum, Structured Computer Organization, 6$^{th}$ EditionPearson Education, (2016) |
| **Online Resources (Weblinks)** |
| 1. https://profile.iiita.ac.in/bibhas.ghoshal/teaching_coa_2021.html
2. https://www.cse.iitd.ac.in/~srsarangi/archbooksoft.html
3. https://onlinecourses.nptel.ac.in/noc22_cs88/preview
4. https://www.coursera.org/learn/comparch
5. https://www.udemy.com/course/computer-organization-and-architecture-j/?srsltid=AfmBOoo3L-F9CWPP3HioEoAzx57cX2iGGEU3Bi0UOLTD0aLRh_BAREfE&couponCode=ST21MT30625G1 |

| Assessment (Theory course) |
| --- |
| CAT, Activity and Learning Task(s), MCQ, End Semester Examination (ESE) |

| Course Curated by | | |
| --- | --- | --- |
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert** |
| - | - | Mr. M. Sathish, Department of Computer Science and Engineering |
| **Recommended by BoS on** | 09.05.2025 | |
| **Academic Council Approval** | No: 28 **Date** | 26.06.2025 |

| 24CSI011 | COMPUTER NETWORKS AND SECURITY (Common to AD, CS, IT) | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 |
| PC | | SDG | 4,9 | | | |

| Pre-requisite courses | Nil | Data Book / Codes / Standards ( If any) | Nil |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1. | Illustrate the basic concepts, architecture, and protocols of computer networks, including the OSI and TCP/IP models. |
|---|---|
| 2. | Familiarize students with networking hardware (routers, switches, firewalls) and basic configuration principles. |
| 3. | Explore the functionalities, differences, and use-cases of major transport protocols such as TCP (Transmission Control Protocol) and UDP (User Datagram Protocol). |
| 4. | Explain the basic security principles such as confidentiality, integrity, availability and explore common threats, vulnerabilities and encryption techniques. |

## Course Outcomes

| After successful completion of this course, the students shall be able to | Bloom's Taxonomy Level (BTL) |
|---|---|
| CO 1 | Understand the principles of data communication and functionalities of standard network reference models. | U |
| CO 2 | Apply error detection methods and flow control techniques to ensure reliable data transmission in network communications. | Ap |
| CO 3 | Implement routing algorithms to recommend optimal paths for efficient packet switching and internetworking. | Ap |
| CO 4 | Apply congestion control mechanisms to assess their effectiveness and identify the functionalities of application layer protocols | Ap |
| CO 5 | Construct a secure data communication model using standard cryptographic algorithms for cyber defense. | Ap |

| Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| Course Outcomes (CO) | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO-1 | PSO-2 |
| 1 | 3 | 3 | | | | | | | | | 2 | 2 | |
| 2 | 3 | 3 | | 3 | | | | | | | | | 2 |
| 3 | 3 | | 3 | 3 | | | | | | | | | 2 |
| 4 | 3 | | 3 | | 3 | | | | | | | | 2 |
| 5 | 3 | 2 | 3 | | | | | | | | 2 | | |

| Course Content | |
|---|---|
| **DATA COMMUNICATIONS**<br>Basics of Data Communication, Network Models: The OSI Model, TCP/IP Protocol Suite, Addressing, Transmission Media, Networking Devices, Network Topologies. | **8 Hours** |
| **Practical Component**<br>Demonstrate the use of network Diagnostic tools such as PING, TRACEROUTE, IPCONFIG , NSLOOKUP AND NETSTAT | **6 Hours** |
| **DATA LINK LAYER**<br>Encoding, Error Detection, Reliable Transmission, MAC Protocols, Multiple Access Protocols: Random Access, Controlled Access and Channelization. | **9 Hours** |
| **Practical Component**<br>Design a network topology in Cisco Packet Tracer with multiple devices, configure IP addresses and network protocols, and verify connectivity and proper communication between all devices. | **6 Hours** |
| **Network Layer**<br>Circuit Switching, Packet Switching, Bridges and LAN Switches, Spanning Tree Algorithm, Internetworking, IPv4, Subnetting, IPv6, Routing Techniques (RIP, OSPF, BGP). | **9 Hours** |
| **TRANSPORT LAYER AND APPLICATION LAYER**<br>UDP, TCP, Congestion Control, Resource Allocation, TCP Congestion Control, Congestion Avoidance Mechanisms, Quality of Service (Integrated Services, Differentiated Services), Network Traffic Analysis. Application Layer -DNS, Email, WWW, HTTP. | **10 Hours** |
| **Practical Component**<br>Capture and analyze network traffic using Wireshark to identify and examine packets, perform traffic analysis to assess network performance, and conduct vulnerability analysis to detect any security issues or anomalies -Implement TCP and UDP client-server applications using UNIX socket programming functions. | **10 Hours** |
| **NETWORKS SECURITY CONCEPTS**<br>Introduction to network security concepts, Network Security Model, Classical Encryption Techniques-Symmetric cipher model, Substitution techniques, Transposition techniques, Block cipher concepts and Data Encryption Standard. | **9 Hours** |
| **Practical Component**<br>Implementation of substitution and transposition technique. | **8 Hours** |

| Theory | | Tutorial | | Practical | | Project | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| Hours: | 45 | Hours: 0 | | Hours: | 30 | Hours: 0 | | Hours: 75 | |

| Learning Resources |
|---|
| **Textbooks** |
| 1. Behrouz A. Forouzan, "Data Communications and Networking with TCPIP Protocol Suite", 6th Edition, Tata McGraw-Hill, New Delhi, (2022).<br>2. Andrew S. Tanenbaum and David J. Wetherall," Computer Networks",Fifth Edition, Prentice Hall Publisher, (2010). |
| **Reference books/ Web Links** |
| 1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach," Fifth Edition, Morgan Kaufmann Publishers Inc., (2011).<br>2. William Stallings, "Data and Computer Communications," Tenth Edition, Pearson Education, (2013). |

| | |
|---|---|
| 3. | James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet," Sixth Edition, Pearson Education, (2012). |
| 4. | William Stallings, "Network Security Essentials: Applications and Standards," Fifth Edition, Pearson Education, (2013). |

**Online Resources**

1. https://www.classcentral.com/course/udacity-computer-networking-2336.
2. https://www.classcentral.com/course/fundamentals-network-communications-9267.
3. https://www.classcentral.com/course/computer-communications-18777.
4. https://www.mygreatlearning.com/academy/learn-for-free/courses/network-security.

| **Assessment (Embedded Course)** |
|---|
| CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce |

| **Course Curated by** | | |
|---|---|---|
| **Expert from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| | | Dr.A. Roshini, Department of Computer Science and Engineering |
| **Recommended by BoS on** | 09.05.2025 | |
| **Academic Council Approval** | No:28 | **Date** |

| 24CSP012 | JAVA PROGRAMMING | L | T | P | J | C |
|---|---|---|---|---|---|---|
| | (Common to AD, CS, IT) | 0 | 0 | 4 | 0 | 2 |
| PC | | SDG | | | 9 | |

| Pre-requisite courses | Nil | Data Book / Codes / Standards (If any) | Nil |
|---|---|---|---|

| Course Objectives: | The purpose of taking this course is to: |
|---|---|
| 1 | Understand the basics of Java programming, including loops, arrays, and string manipulations. |
| 2 | Apply the principles of Object-Oriented Programming (OOP) such as inheritance, polymorphism, and abstraction. |
| 3 | Learn and implement Java Collections, Strings, and lambda expressions. |
| 4 | Enable students to perform file operations and utilize the Java Collection Framework. |
| 5 | Train Students in developing graphical user interfaces (GUIs). |

| Course Outcomes: | After successful completion of this course, the students shall be able to | Bloom's Taxonomy Level (BTL) |
|---|---|---|
| CO 1 | Apply the core principles of Java programming and Object-Oriented Programming (OOP) concepts to write modular, efficient Java applications | Ap |
| CO 2 | Utilize Java packages, interfaces, and exception handling mechanisms to build reusable and error-resilient code | Ap |
| CO 3 | Develop multi-threaded applications and perform string and wrapper class manipulations in Java. | Ap |
| CO 4 | Analyse input/output operations and use Java's collection framework for real-time data storage and retrieval | An |
| CO 5 | Develop GUI-based Java applications using event controls and connect them to databases using JDBC | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO-1 | PSO-2 |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 2 | 2 | 3 | | 2 | | | | | | | 2 | |
| 2 | 2 | 2 | 3 | | | | | | | | | | |
| 3 | 2 | 2 | 3 | | | | | | 2 | 2 | | | |
| 4 | 3 | 3 | 2 | | | | | | 1 | 2 | | 2 | |
| 5 | 2 | 2 | 3 | | | | | | | | | | |

| Course Content | |
|---|---|
| **JAVA PROGRAMMING BASICS**<br>OOP Basics – Java Features -Java Programming Concepts, Control statement, Arrays, Method Overloading, Abstract Classes, Inheritance, Method Overriding | **12 Hours** |
| **PACKAGES, INTERFACES AND EXCEPTION HANDLING**<br>Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces, Exception Handling-Try, Catch, and Finally, Throw and Throws Clause-User-defined Exception | **12 Hours** |
| **MULTITHREADING AND STRINGS**<br>Multithreaded Programming: Life cycle of a thread -Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication–Multithreading- Wrappers – Auto boxing - String handling – String operations -String methods - Wrapper classes | **12 Hours** |
| **FILES AND COLLECTION FRAMEWORK**<br>I/O Basics – Reading and Writing Console I/O – Reading and Writing Files -Streams - Byte streams and Character streams - Java Collection Framework-Array List, LinkedList, Stack, Queue, Map, Generic Collections, Introduction to Lambda Expressions | **12 Hours** |
| **EVENT HANDLING, CONTROLS AND COMPONENTS**<br>Applet Fundamentals-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-JDBC connectivity | **12 Hours** |

| Theory Hours: | Tutorial Hours: | Practical Hours: | 60 | Project Hours: | Total Hours: | 60 |
|---|---|---|---|---|---|---|

| Learning Resources |
|---|

| **Textbooks** |
|---|
| 1. Herbert Schildt, Java: The Complete Reference, 12th Edition, McGraw-Hill Education, 2022.<br>2. Kathy Sierra and Bert Bates, Head First Java, 2nd Edition, O'Reilly Media, 2005.<br>3. Rod Johnson, Expert One-on-One J2EE Development without EJB, Wiley Publishing, 2004. |
| **Reference books/ Web Links** |
| 1. Bruce Eckel, Thinking in Java, 4th Edition, Prentice Hall, 2006.<br>2. Josh Long, Cloud Native Java: Designing Resilient Systems with Spring Boot, Spring Cloud, and Cloud Foundry, O'Reilly Media, 2017.<br>3. Craig Walls, Spring in Action, 5th Edition, Manning Publications, 2018.<br>4. Paul Deitel and Harvey Deitel, Java How to Program, 11th Edition, Pearson, 2017. |
| **Online Resources** |
| 1. https://www.coursera.org/specializations/java-programming<br>2. https://www.edx.org/learn/java<br>3. https://www.codecademy.com/learn/learn-java<br>4. https://docs.oracle.com/en/java/javase/ |

| **Assessment (Practical course)** |
|---|
| Lab Workbook, Mini project, Experimental Cycle tests, viva-voce and End Semester Examination |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert(s)** |
| - | - | Dr.S.Sathyavathi, Ms.G.Shobana Assistant Professor Department of Information Technology |
| **Recommended by BoS on** | 09.05.2025 | |
| **Academic Council Approval** | No: 28 | **Date** 26.06.2025 |

| 24CSI213 | **CLOUD COMPUTING** | **L** | **T** | **P** | **J** | **C** |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 |
| **PC** | | **SDG** | | | 9 | |

| **Pre-requisite courses** | **Nil** | **Data Book / Codes / Standards ( If any)** | Nil |
|---|---|---|---|

| **Course Objectives:** | **The purpose of taking this course is to:** |
|---|---|
| 1 | Understand the basics and benefits of cloud computing. |
| 2 | Explore different types of cloud models and services. |
| 3 | Examine cloud migration strategies and approaches. |
| 4 | Analyze risk measurement, assessment, and mitigation strategies in application migration. |
| 5 | Understand the economic cost models for cloud planning and leverage cloud technologies to optimize resource allocation. |

| **Course Outcomes**: | **After successful completion of this course, the students shall be able to** | **Bloom's Taxonomy Level (BTL)** |
|---|---|---|
| CO 1 | Understand the fundamental concepts and deployment models of cloud computing to demonstrate virtualization. | U |
| CO 2 | Classify cloud service models to categorize their benefits, risks, and use cases. | U |
| CO 3 | Analyze vendor roles and capabilities for successful cloud adoption. | An |
| CO 4 | Design a migration plan for application transition to the cloud securely. | Ap |
| CO 5 | Apply cloud infrastructure strategies to manage cloud resource allocation through economic models. | Ap |

| Course Outcomes (CO) | **Program Outcomes (PO)** (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | **Program Specific Outcomes (PSO)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | | |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | PSO-1 | PSO-2 |
| 1 | 3 | 2 | | | | | | | | | 2 | 3 | |
| 2 | 3 | 3 | | | | | | 2 | | | | 3 | |
| 3 | 3 | | 3 | | | | | | | 2 | | 3 | |
| 4 | 3 | 2 | | | | | | | | | 3 | 3 | |
| 5 | 3 | | 3 | | | | | | | 3 | | 3 | |

| **Course Content** | |
|---|---|
| **FUNDAMENTALS OF CLOUD COMPUTING** Cloud Computing Basics – History – Peer to peer computing - Distributed computing – Characteristics of cloud -  Pros and Cons of cloud computing – Cloud Deployment | **10 Hours** |

| | |
|---|---|
| Models – Public, Private, Hybrid, Community - Evolving Data Center into Private Cloud - Data center Components – Virtualization - KVM, VMware ESXi,, Xen - Data center security - Security layers - Host, network, VM, user access - Extracting Business value in Cloud Computing - Cloud Scalability - Distribution over the Internet<br><br>**Practical Component**<br>Set up the KVM hypervisor and verify virtualization support. - Deploy a Linux VM using virt-install in KVM – execute linux commands in Linux VM - create a VM Snapshot and Restore it in KVM - Create a Windows VM in VirtualBox and configure the network to check the Internet connection – Create and run a simple Linux VM in VirtualBox – Install VMWare work station and Create a VMs - Configure Virtual Networking to provide communication between VMs. | **8 Hours** |
| **CLOUD DELIVERY MODELS**<br>Introduction to Cloud Services - Infrastructure as a Service (IaaS) – Networking options - Virtual Private Cloud - Storage Management in IaaS - Persistent vs. ephemeral storage - File and Object storage - Data Protection – Container - VM vs Containers - Overview of OpenNebula as an IaaS platform - IaaS security - Benefits and challenges in using IaaS - Platform as a Service (PaaS) – Overview - PaaS Examples – Aneka Overview – Aneka Architecture – Aneka Programming Models - Benefits and challenges - Software as a Service (SaaS) – Introducing SaaS, SaaS Examples - Evaluating SaaS – user and vendor perspective - Impact of SaaS - Benefits and risks of SaaS - IaaS vs PaaS vs SaaS.<br><br>**Practical Component**<br>Create windows and Linux VMs in different IaaS platforms, Create a VPC in public cloud – Host a website in any IaaS platform - Run OpenNebula Sandbox via VirtualBox/VMware and deploy a VM - Create a Custom VM Template in OpenNebula - Deploy a sample app on a PaaS platform - Use a SaaS product Google Docs or Canva and list its features - Compare IaaS, PaaS, SaaS with real-world examples and prepare a report | **15 Hours**<br><br><br><br><br><br><br><br>**10 Hours** |
| **CLOUD COMPUTING - CHALLENGES, RISK AND MITIGATION**<br>Cloud Storage, Application performance, Data Integration, Security. Ensuring Successful Cloud Adoption-Designing a Cloud Proof of Concept, Vendor roles and capabilities, moving to the Cloud. Impact of Cloud on IT Service Management. Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies Risks and Consequences of Cloud Computing- Legal Issues, Compliance Issues, Privacy and Security.<br><br>**Practical Component**<br>Create and apply security groups in any cloud, Set user roles and permissions using Identity and Access Management. | **12 Hours**<br><br><br><br><br><br>**06 Hours** |
| **MANAGING THE CLOUD**<br>Managing and Securing Cloud Services, Managing Desktops and devices on the cloud, SOA and Cloud computing, Managing the Cloud environment, Planning for the Cloud – Economic Cost Model and Leveraging the Cloud, Cloud computing resources<br><br>**Practical Component**<br>Measure the resource utilization in a public cloud platform and list the usage of CPU, RAM, storage in a VM – create snapshot and generate backup of cloud instances, configure and activate cloud pricing calculators in any public cloud platform to estimate cost for running a basic app. | **08 Hours**<br><br><br><br>**06 Hours** |

| Theory Hours: | 45 | Tutorial Hours: | 0 | Practical Hours: | 30 | Project Hours: | 0 | Total Hours: | 75 |
|---|---|---|---|---|---|---|---|---|---|

| Learning Resources |
|---|
| **Textbooks** |
| 1. Thomas Erl, Eric Barceló Monroy, Cloud Computing: Concepts, Technology, Security & Architecture, 2nd Edition - Pearson Paperback – 29 February 2024.<br>2. Kirk Hausman, Susan L. Cook, Telmo Sampaio, " CLOUD ESSENTIALS CompTIA® Authorized Courseware for Exam CLO-001", John Wiley & Sons Inc., 2013<br>3. Judith Hurwitz , Robin Bloor , Marcia Kaufman , Fern Halper, "Cloud Computing for Dummies", Wiley Publishing Inc., 2010 |
| **Reference books/ Web Links** |
| 1. Lauri Swede, Cloud Computing Essential Guide: A Foundational Understanding of Cloud Computing, Kindle Edition , 2022.<br>2. Erl," Cloud Computing: Concepts, Technology & Architecture", Pearson Education, 2014<br>3. Srinivasan, "Cloud Computing: A Practical Approach for Learning and Implementation "Pearson Education, 2014 |
| **Online Resources** |
| 1. https://www.coursera.org/learn/cloud-computing<br>2. https://explore.skillbuilder.aws/learn/courses/134/aws-cloud-practitioner-essentials<br>4. https://www.cloudskillsboost.google/paths/11<br>5. https://developer.hashicorp.com/terraform/tutorials/aws-get-started |

| Assessment (Embedded course) |
|---|
| CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)<br>Lab Workbook, Experimental Cycle tests, viva-voce |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert** |
| | - | Mr. C. Jeganathan, Department of Information Technology |
| **Recommended by BoS on** | 09.05.2025 | |
| **Academic Council Approval** | No: 28 | **Date** 26.06.2025 |

| 24ADI003 | **MACHINE LEARNING** | **L** | **T** | **P** | **J** | **C** |
|---|---|---|---|---|---|---|
| | **(Common to AD, CS, IT)** | **3** | **0** | **2** | **0** | **4** |
| **PC** | | **SDG** | | **9** | | |

| Pre-requisite courses | 24MAI234 Computational Probability and Statistics | Data Book / Code book (If any) | Nil |
|---|---|---|---|

## Course Objectives:

The purpose of taking this course is to:

| 1 | Introduce the fundamental concepts of machine learning, its life cycle and ethical considerations. |
|---|---|
| 2 | Explore various supervised and unsupervised learning techniques and optimization strategies. |
| 3 | Examine recommendation systems, and its evaluation techniques. |

## Course Outcomes

| After successful completion of this course, the students shall be able to | | Revised Bloom's Taxonomy Levels (RBT) |
|---|---|---|
| CO1 | Apply appropriate data pre-processing techniques to build machine learning models with ethical considerations. | Ap |
| CO2 | Analyze and optimize regression models using estimation techniques, regularization, and gradient-based methods through error analysis. | An |
| CO3 | Build and evaluate the effectiveness of different classification models and ensemble techniques. | E |
| CO4 | Analyze complex datasets using advanced clustering, associative rule mining and dimensionality reduction algorithms to uncover meaningful patterns and groupings. | An |
| CO5 | Develop recommendation systems to personalize user needs. | Ap |

| Course Outcomes (CO) | Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **PSO-1** | **PSO-2** |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 2 | | | | | 2 | 2 | | | | | 2 | |
| 2 | 3 | 2 | | | 2 | | | | | | 2 | 3 | 2 |
| 3 | 3 | 2 | | | 2 | | | | | | 2 | 3 | 2 |
| 4 | 3 | 2 | | | 2 | | | | | | 2 | 3 | 2 |
| 5 | 3 | 2 | | | 2 | | | | | | 2 | 3 | 2 |

## Course Content

| **INTRODUCTION** | **7 Hours** |
|---|---|
| Introduction to Machine Learning-Types of machine learning: Supervised, Unsupervised, Semi supervised and Reinforcement Learning-Applications of machine learning in various fields- Ethics in machine learning- Fairness, accountability and interpretability -Machine learning workflow- Data Preprocessing-Feature engineering- | |

| | |
|---|---|
| Correlation analysis- Model training and evaluation- Model monitoring and maintenance.<br><br>**Practical Component**<br>Introduction to Python libraries for Machine Learning-Preprocessing of dataset | **4 Hours** |
| **REGRESSION MODELS**<br>Linear regression- Simple Regression-Least Square Estimator-Maximum Likelihood Estimator– Multiple Regression –Polynomial Regression-Performance Metrices-Bias Variance Tradeoff- Overfitting – Underfitting – Gradient descent – Regularization<br><br>**Practical Component**<br>Implementation of regression problems- Optimization of regression model | **8 Hours**<br><br><br><br><br><br><br>**6 Hours** |
| **CLASSIFICATION MODELS**<br>Logistic Regression-Naive Bayes Classifiers-Decision Tree-K-Nearest Neighbors-Support Vector Machine – Evaluation metrices – AUC ROC- Class Imbalance –SMOTE – Cross-Validation Techniques-Ensemble Learning-Bagging- Random Forests-Boosting - AdaBoost -Gradient Boosting<br><br>**Practical Component**<br>Implementation of classification models- Evaluation of models using performance metrices. | **12 Hours**<br><br><br><br><br><br><br>**8 Hours** |
| **UNSUPERVISED LEARNING**<br>Clustering- K-means Clustering- Gaussian Mixture Models -Hierarchical Clustering- Density-Based Clustering (DBSCAN)- Mean-Shift Clustering- Spectral Clustering- Association Rule Learning- Apriori Algorithm- FP-Growth Algorithm- Dimensionality Reduction- Principal Component Analysis (PCA)- Linear Discriminant Analysis (LDA)<br><br>**Practical Component**<br>Implementation of clustering algorithms- Identification of patterns- Detection of outliers | **10 Hours**<br><br><br><br><br><br><br><br>**6 Hours** |
| **RECOMMENDATION SYTEMS**<br>Introduction to Recommendation Systems-Types- Challenges- Collaborative Filtering Techniques- User-Based-Collaborative Filtering- Item-Based- Collaborative Filtering-Matrix Factorization Techniques- Content-Based Recommendation- Hybrid Recommendation Systems- Evaluation of Recommendation Systems<br><br>**Practical Component**<br>Implementation of Collaborative Filtering-based Recommendations- Implementation of Matrix Factorization-based recommendations- Building a Recommendation system based on item features | **8 hours**<br><br><br><br><br><br><br>**6 Hours** |

| Theory | Tutorial | Practical | Project | Total |
|---|---|---|---|---|
| Hours:45 | Hours:0 | Hours: 30 | Hours:0 | Hours:75 |

| **Learning Resources** |
|---|
| **Textbooks** |
| 1.      Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Fourth Edition, (2020).<br>2.      Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, Foundations of Machine Learning, Second Edition, MIT Press, (2018).<br>3.      Falk, Kim, Practical Recommender Systems, United States, Manning, (2019). |
| **Reference** |
| 1.      Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition (1997). |

| | |
|---|---|
| 2. | Sebastain Raschka, Vahid Mirjalili , Python Machine Learning, Packt publishing 3rd Edition, (2019). |
| 3. | M.Gopal, Applied Machine Learning, McGraw Hill Education, New York, (2018). |

**Online Resources (Weblinks)**

| | |
|---|---|
| 1. | https://www.coursera.org/specializations/machine-learning-introduction |
| 2. | https://onlinecourses.nptel.ac.in/noc19_cs53/preview |
| 3. | https://pll.harvard.edu/course/data-science-machine-learning |

## Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

## Course Curated by

| Expert(s) from Industry | Expert(s) from Higher Education Institution | Internal Expert(s) |
|---|---|---|
| - | - | Ms. Tharsanee R M, AP/Artificial Intelligence & Data Science |
| **Recommended by BoS on** | 09.05.2025 | |

| | | | |
|---|---|---|---|
| **Academic Council Approval** | No: 28 | **Date** | 26.06.2025 |

| 24ITT013 | **APTITUDE AND REASONING – II**<br>(Common to AD, CS, IT) | **L** | **T** | **P** | **J** | **C** |
|---|---|---|---|---|---|---|
| | | 0 | 1 | 0 | 0 | 1 |
| **HS** | | **SDG** | | | **9** | |

| **Pre-requisite courses** | **Nil** | **Data Book / Codes / Standards ( If any)** | **Nil** |
|---|---|---|---|

## Course Objectives:

| The purpose of taking this course is to: | |
|---|---|
| 1 | Familiarize the aptitude test patterns used by multinational companies and government organizations. |
| 2 | Use reasoning and aptitude skills to solve real-world problems typically faced in business and technical environments. |
| 3 | Enable to solve calendar-based problems. |

## Course Outcomes:

| After successful completion of this course, the students shall be able to | | Bloom's Taxonomy Level (BTL) |
|---|---|---|
| CO 1 | Solve puzzles problems using structured and step-by-step logic. | Ap |
| CO 2 | Solve time and distance-based problems effectively | Ap |
| CO 3 | Assess mental calculation speed using Vedic math techniques and shortcuts for quicker problem solving. | E |
| CO 4 | Develop test-taking strategies to handle quantitative and reasoning questions under time and calendar constraints. | Cr |

| Course Outcomes (CO) | **Program Outcomes (PO)** (Strong-3, Medium – 2, Weak-1) | | | | | | | | | | | **Program Specific Outcomes (PSO)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **PSO-1** | **PSO-2** |
| | Engineering Knowledge | Problem Analysis | Design/Development of Solutions | Conduct Investigations of Complex Problems | Engineering Tool Usage | The Engineer and The World | Ethics | Individual and Collaborative Team work | Communication | Project Management and Finance | Life-Long Learning | | |
| 1 | 3 | | | | | | | | | | 3 | | |
| 2 | 3 | | 2 | | | | | | | | 3 | 2 | |
| 3 | 3 | | | | | 2 | | | | | 3 | 2 | |
| 4 | 3 | | | | | | | | | | | | |

## Course Content

| SIMPLE AND COMPOUND INTEREST, PROBABILITY<br>Basic formulae and shortcuts, Difference between simple and compound interest, Annual and half-yearly compounding, Incremental and Depreciation Problems, Equal Instalments, Probability – Concepts, Probability Laws, Successive and One by one draw methods. | **3 Hours** |
|---|---|
| SPEED, TIME AND DISTANCE, PROBLEMS ON TRAINS<br>Total Distance, Average Speed Calculations, Relative Speed, Train Crossing a Pole, Train Crossing a Platform, Bridge, Tunnel, Two Trains Crossing Each other. | **3 Hours** |

| BOATS AND STREAMS, SYLLOGISM | 3 Hours |
|---|---|
| Stream and Boat Moving in Same Direction, Stream and Boat Moving in Opposite Directions, Downstream and Upstream Time Calculations, Syllogism - Venn Diagram Method, Analytical Method, Possibility-based Syllogisms | |
| **NUMBER SERIES, MIXTURES AND ALLIGATIONS** | **3 Hours** |
| Missing Numbers Series, Wrong Number Series, Next Number Sequence, Alpha Numeric pattern, Number and Letter Series, Rule Alligations, Replacement Problems, Mixture Concentration. | |
| **CALENDAR, CLOCKS, PUZZLES** | **3 Hours** |
| Day, Date, and Year Identification Problems, Clocks – Mirror image, Angle Calculations, Odd one out, Pattern recognition, Box-based puzzles Floor-based puzzles | |

| Theory Hours: | 0 | Tutorial Hours: | 15 | Practical Hours: | 0 | Project Hours: | 0 | Total Hours: | 15 |
|---|---|---|---|---|---|---|---|---|---|

| Learning Resources |
|---|
| **Textbooks** |
| 1. R.S. Agarwal, A Modern Approach to Logical Reasoning – comprehensive for verbal and non-verbal reasoning, S. Chand Publisher, (2022). |
| **Reference books/ Web Links** |
| 1. Arun Sharma, How to Prepare for Quantitative Aptitude for the CAT, McGraw Hill, (2021). |
| **Online Resources** |
| 1. https://crm.mastersacademy.in/ |

| Assessment |
|---|
| MCQ |

| Course Curated by | | |
|---|---|---|
| **Expert(s) from Industry** | **Expert(s) from Higher Education Institution** | **Internal Expert** |
| Mr. Vivekanand, CEO and Founder – Masters Academy | - | Dr. D. Sudharson, Department of Artificial Intelligence and Data Science |
| **Recommended by BoS on** | 09.05.2025 | |
| **Academic Council Approval** | No: 28 | **Date** 26.06.2025 |