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 (2024 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

2024 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	24CSI101	Logical Thinking and Problem Solving	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	24CSI103	Computer Graphics	Embedded	BS	2	0	2	0	3
4	24CSI104	Data Structures and Algorithms	Embedded	ES	3	0	2	0	4
5	24CSI105	Embedded Computing Systems	Embedded	ES	2	0	2	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	**20**
								Total Contact Hours/week	**32**

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	24CSI008	Object Oriented Programming	Embedded	ES	3	0	2	0	4
3	24CSI009	Database Management Systems	Embedded	PC	3	0	2	0	4
4	24ADI001	Artificial Intelligence and Automation	Embedded	PC	3	0	2	0	4
5	24INP201	Innovation Practicum- 3	Practical	ES	0	0	2	0	1
6	24HSP006	Mastering Group Discussion and Presentation Skills	Practical	HS	0	0	2	0	1
7	24INOXYY	FCLF- General Stack-3	Practical	OE	0	0	2	0	1
8	24CSJ210	Social Internship	Project	PRJ	0	0	0	2	1
9	24ADT015	Finance, Economics and Marketing	Theory	HS	3	0	0	0	3
10	24ITT012	Aptitude and Reasoning – I	Theory	HS	0	1	0	0	1
11	24ADV001	Python Programming	Practical	VAC	0	0	2	0	0
								Total Credits	**24**
								Total Contact Hours/week	**29**
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

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 V	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	6	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		
	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		3		
2							2	2	3		3		
3							2	2	3		3		

Course Content	
Text Analysis 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 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 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 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 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 Hours: 30	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total 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 , Project manager, Toppan Merrill. Technologies,	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini,	Dr. Arokia Lawrence Vijay Dr. Sreejana Dr. Tissaa

Coimbatore	Anna University, Chennai Dr. E. Justin Ruben, 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

	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						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 Writing Reflective Essays / Experience Sharing, Process writing, Transcoding graphics (interpreting technical texts), Writing Reviews (Research Articles & Books).	**6 Hours**
Building a Professional Digital Presence 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 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

	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	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. **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.	**9 Hours** **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) **Practical Component** Linearly independent and dependent vectors and Singular Value Decomposition. Curve Tracing, 3D and Surface plotting.	**9 Hours** **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 **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.	**9 Hours** **6 Hours**

FUNCTIONS OF SEVERAL VARIABLES 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 **Practical Component** Computing partial derivatives of multivariable functions Optimization problems in multiple variables	**9 Hours** **6 Hours**
ORDINARY DIFFERENTIAL EQUATIONS Solutions of first order linear ODE: Leibnitz equation and Bernoulli's equation – Linear, homogeneous differential equations of second and higher order with constant coefficients. **Practical Component** Solution of first order ordinary differential equations. Solution of second and higher order ordinary differential equations	**9 Hours** **6 Hours**

Theory Hours: 45	**Tutorial Hours: 0**	**Practical Hours: 30**	**Project Hours: 0**	**Total 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 (Common to AD, CS, IT)	L	T	P	J	C
		3	0	2	0	4
BS		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)	
	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												
2	3												
3	3	2									2		
4	3										2		
5	3	2											
6	3	2											

Course Content

Applied optics — **9 Hours**

Wave Behaviour in Optics: Reflection, Refraction, Interference, Diffraction and Polarization (qualitative) - Interaction of light and matter - Absorption - Spontaneous emission - Stimulated emission - Population inversion - CO2 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.

Practical Component — **6 Hours**

- Semiconductor laser:
  a) Determination of wavelength of laser
  b) Determination acceptance angle and numerical aperture of an optical fibre.
  c) Determination of particle size
- Spectrometer – Determination of wavelength of mercury source using grating

Quantum physics — **9 Hours**

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.

Practical Component — **6 Hours**

- Determination of band gap of a semiconductor
- Determination of efficiency of solar cell
- Determination of Planck's constant – Electroluminescence method

Thermal Physics — **9 Hours**

Transfer of heat energy – conduction, convection, and radiation – thermal expansion of solids and liquids – expansion joints – bimetallic strips – theory of heat conduction in solids –

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. **Practical Component** Lee's Disc method: Determination of thermal conductivity of a bad conductor	**6 Hours**
Mechanics 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. **Practical Component** • Compound pendulum – Determination of acceleration due to gravity • Non-uniform bending – Determination of Young's modulus	**9 Hours** **6 Hours**
Acoustics 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. **Practical Component** Melde's string – Determination of frequency of a tuning fork	**9 Hours** **6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total 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 Dr. S.Nithya Department of Physics	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24CSI101	LOGICAL THINKING AND PROBLEM SOLVING (Common to all Programmes)	L	T	P	J	C
		3	0	2	0	4
ES		SDG	8, 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 computing systems, including their classification, processing units, memory structures, storage hierarchies, and the essential functions and types of operating systems
2	develop strong logical and analytical thinking skills, enabling the systematic analysis and solution of computational problems using reasoning techniques, algorithms, and flowcharts.
3	acquire a solid foundation in C programming, mastering the use of data types, operators, control structures, and input/output operations to create efficient and effective programs.
4	apply advanced programming techniques, including the use of arrays, structures, pointers, and functions, to solve complex real-world problems with a focus on modular and efficient coding practices.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	understand the basic concepts of hardware, software, Operating systems, and the logic behind the functioning of the Computing systems.	U
CO2	apply logical thinking and reasoning to solve computing problems using tools like algorithms and flowcharts.	Ap
CO3	understand the structured programming paradigms, memory organization and how the language can be used as a tool to solve problems.	U
CO4	develop simple programs using data types, operators, control structures, pointers, and functions as appropriate in real world applications.	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	1									3	
3		1										2	
4	3	2	1									3	

Course Content

FUNDAMENTALS OF COMPUTERS AND COMPUTING	6 Hours
Generations of computers, and classification of computers (supercomputers, mainframes, minicomputers, microcomputers). Processing Units (CPU, GPU, TPU),	

memory (RAM, ROM), storage devices and hierarchy, input / output and peripheral devices. System software, application software. Operating Systems - Functions (process management, memory management, file system management, device management, security), types of operating systems (desktop, mobile, networking, distributed, real-time, embedded). **Number Systems**: Introduction to different number systems (binary, octal, decimal, hexadecimal), conversions between number systems, and binary arithmetic (addition, subtraction, multiplication, division). **Practical Component** Exploring hardware and software components	 **4 Hours**
LOGICAL THINKING, REASONING AND TOOLS Problem Analysis – Logical Thinking vs Critical Thinking vs Design Thinking - Inference – Inductive Reasoning – Deductive Reasoning – **Logical Thinking Tools: Algorithms**: Definition and importance, characteristics of algorithms (finite, clear and unambiguous, well-defined inputs and outputs, feasible). Algorithm representation Techniques: Pseudocode, stepwise refinement, and top-down design. **Flowcharts**: Symbols used in flowcharts, creating flowcharts, and examples of flowchart-based problem-solving. **Practical Component** Algorithm writing and Flowcharts,	**8 Hours** **4 Hours**
PROGRAMMING PARADIGMS AND INTRODUCTION TO C PROGRAMMING **Programming Paradigms**: Structured programming - functional programming - object-oriented programming. **Introduction to C Programming**: History of C - features of C - structure of a C program – input / output statements. **Data Types**: Primitive data types (int, char, float, double) - derived data types, typecast. **Operators**: Arithmetic operators - relational operators - logical operators - bitwise operators - assignment operators - operator precedence. **Conditional Statements**: If - if-else - nested if - switch-case. **Looping Statements**: For loop - while loop - do-while loop. Pre-processor Directives and Command line arguments, Storage Classes. **Practical Component** Programs on Operator precedence, Decision Making, Iterations	 **11 Hours** **10 Hours**
ARRAYS AND STRUCTURES **Collections**: Arrays – 2D Arrays – String Manipulation. **Structures and Unions**: Definition - declaration - accessing members - differences between structures and unions - applications. **Practical Component** Programs on Arrays, Structures, Union,	**10 Hours** **6 Hours**
POINTERS AND FUNCTIONS **Pointers**: Definition - declaration - pointer arithmetic - pointers and arrays. **Functions**: Definition - declaration - types of functions (user-defined, library functions) - parameter passing (by value, by reference) pointers and functions, recursion. **Practical Component** Pointers and Functions. Additional programs on Files to be discussed.	**10 Hours** **6 Hours**

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

Learning Resources
Textbooks:

1. Kanetkar, Yashavant. Let Us C. BPB Publications, New Delhi (2023).
2. Rajaraman, V. Fundamentals of Computers. PHI Learning, New Delhi (2020).
3. Dromey, R.G. How to Solve it by Computer. Prentice Hall International, New York (2008).

Reference

1. Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms. MIT Press, Cambridge (2022).
2. Balagurusamy, E. Programming in ANSI C. McGraw Hill Education, New York (2021).
3. Kernighan, Brian W., and Dennis M. Ritchie. The C Programming Language. Prentice Hall, New York (2017).
4. Patterson, David A., and John L. Hennessy. Computer Organization and Design: The Hardware/Software Interface. Morgan Kaufmann, San Francisco (2017).

Online Resources (Weblinks)

1. https://nptel.ac.in/courses/106105214
2. https://www.coursera.org/learn/computer-fundamentals
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/c-programming-language/

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. S. Kavitha, Department of Information Technology

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

24CSI102	DIGITAL LOGIC CIRCUITS (Common to AD, CS, IT)	L	T	P	J	C
		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 — **7 Hours**

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.

Practical Component — **4 Hours**

Study of logic gates

1. Implement Boolean functions using logic gates and validate the outputs with truth tables	
COMBINATIONAL LOGIC CIRCUITS 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. **Practical Component** 1. Design and construct half adders, full adders, half subtractors, and full subtractors. 2. Create combinational circuits to solve real-world problems. 3. Develop a code converter circuit using logic gates. 4. Design and implement decoder and encoder circuits. 5. Construct multiplexers and demultiplexers and incorporate them into circuit designs.	**8 Hours** **14 Hours**
SEQUENTIAL LOGIC CIRCUITS 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). **Practical Component** 1. Implement and test various types of shift registers. 2. Design and build a synchronous and asynchronous counter.	**8 Hours** **8 Hours**
LOGIC FAMILIES AND PROGRAMMABLE DEVICES 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. **Practical Component** 1. Study of VHDL models for combinatorial circuits.	**7 Hours** **4 Hours**

Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total 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.
2. John F. Wakerly, "Digital Design: Principles and Practices", 5th Edition, Pearson, 2018.
3. Donald P leach, Albert Paul Malvino, Goutam Saha, "Digital Principles and Application", 8th Edition, McGraw Hill education Private Limited, 2015.
4. Clive Woods, Brian Holdsworth, "Digital Logic Design", 4th Edition, O'Reilly Media, 2002.
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
2. Digital Logic Circuits and Design | Udemy
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 Ms. P. Anitha, AP-I 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 (Common to all Departments)	L	T	P	J	C
		1	0	0	0	1
HS		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. 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. 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- தினணக்கோட்பாடுகளை ஆராய்தல்- இந்திய தேசிய இயக்கத்தில் தமிழர்களின் பங்கினை அறிதல். 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. Enhance the fundamental knowledge of Tamil language and literature	U
CO2	பழங்கால பாறை ஓவியங்கள், சிற்பம் என கலைகள் நவீன காலம்வரை எவ்வாறு பயணிக்கிறது என்பதை புரிந்துகொள்ளுதல். 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. 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

	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	2	2		2		
2							3	3	2		2		
3							3	2	2		2		

Course Content	
மொழி மற்றும் இலக்கியம் 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. **LANGUAGE AND LITERATURE** 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 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. **HERITAGE – ROCK ART PAINTINGS TO MODERN ART SCULPTURES** 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 தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	**3 Hours**

FOLK AND MARTIAL ARTS Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Ciabatta, Valari, Tiger dance - Sports and Games of Tami	
தமிழர்களின் திணைக்கோட்பாடுகள் 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. **THINAI CONCEPTS OF TAMIL** 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 இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு. **CONTRIBUTIONS OF TAMIL TO INDIAN NATIONAL MOMENT AND INDIAN CULTURE** 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 Hours: 15	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total 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=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e 2. https://www.youtube.com/watch?v=j6_ddjn_gLc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e&index=2 3. https://docs.google.com/presentation/d/1pf0jbyuDTNdvlcKMnOfoPjbqha7JqdOc/edit#slide=id.p1 4. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_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 (Common to all Departments)	L	T	P	J	C
		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		
	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		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 Transdisciplinary systems to accelerate innovation - Manu'Futuring: Technology in hardware manufacturing and manufacturing of hardware technologies - Future scopes with product case studies.	**6 Hours**
Building Custom Hardware How to build a basic custom hardware - Electronics fundamentals and components - Software for hardware control - Fabrication techniques.	**6 Hours**

System Thinking and Engineering Introduction to system thinking - Real world as a system - Concept of system engineering and its application – iLenSys.	**7 Hours**
Creativity Time and Tech Teardown 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 Hours:	0	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total 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 Director - Innovation Practicum Associate VP - Forge. Innovation	-	Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24HSP111	HOLISTIC WELLNESS-1 (Common to all Department)	L	T	P	J	C
		0	0	2	0	1
HS		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		
	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		1					
2						2							
3						1					3		
4						2					3		

Course Content

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

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

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

Learning Resources

Textbooks:

1. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
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)
2. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
3. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
4. Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
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
2. Yoga for well-being
3. Nutritional Educational contents
4. Introduction to Psychology
5. Guided Meditation
6. Simplified physical exercises instructions
7. Simplified Physical Exercises
8. Life skills and value education
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 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		
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

accessible to all - apps for social teaching - Direction for learning to attain learning outcomes - Connecting learning with opportunities	
AGRICULTURE (CROPS, DAIRY, POULTRY) 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 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 **AI in Music:** Composition and Production - Sound Design and Mixing - Music Recommendation - Personalized Learning - Rights Management and Copyright **AI in Law:** Legal Research - Contract Analysis and Drafting - Predictive Analytics - Document Automation - Compliance Monitoring **AI in Textiles:** Design and Trend Prediction - Quality Control - Supply Chain Optimization - Personalization and Customization - Sustainability	**6 Hours**
GAMING 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 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
2. What future for education? | Coursera
3. Sustainable Agricultural Land Management | Coursera
4. IoT Enabled Farming | Coursera
5. Introduction to Healthcare | Coursera
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

	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	Communication	Project Management and Finance	Life-Long Learning	PSO 1	PSO 2
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 Social Interactions: - (Ordering food at a restaurant- Making a reservation at a hotel-- Shopping at a store-- Attending a party or social gathering) Travel and Tourism:(Asking for directions- Booking a flight or hotel-- Exploring a new city- Interacting with local people) 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 Education and Personal Growth:(Setting goals- (Short term & Long term)- Creating a study plan- Participating in a workshop- Reflecting on personal growth) Technology and Online Interactions:(Participating in an online meeting- Creating a social media post- Writing an email or text message- Making an online purchase) 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 Critical Thinking :(Evaluating a news article-solving a moral dilemma-Decision with incomplete information-Assessing a historical event) Problem-Solving:(Resolving a conflict- Negotiating a deal - Making a complaint-Apologizing for a mistake) 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 Cultural Exchange:(Sharing customs and traditions- Discussing cultural differences-Exploring historical events- Participating in a cultural festival) Media and Entertainment:(Event planning- Creating an advertisement-Digital Marketing-Conducting interviews- Creating news broadcast- Writing and Performing a script- Enacting one act plays) Arts and Culture:(Visiting an art gallery - Attending/ organizing a concert or play - Discussing literature- Creating a piece of art)	**6 Hours**

Theory Hours:	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours:
0	0	30	0	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 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 Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Dr. Arokia Lawrence Vijay Dr. Tissaa Tony 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

	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	PSO1	PSO 2
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. **Practical Component** • Double and triple integration with constant and variable limits. • Area as double integral and volume as triple integral.	**9 Hours** **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) **Practical Component** • Evaluation of gradient, divergence, and curl • Verification of Green's theorem in the plane	**9 Hours** **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). **Practical Component** • Fitting polynomials curve by Least Square method. • Fitting non-linear curves by Least Square method.	**9 Hours** **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. **Practical Component** • Time series construction and Measurement of Trend by Moving Averages. • 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 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 **Practical Component** • Numerical Differentiation - Newton's divided differences. • Numerical Integration using Trapezoidal and Simpson's rule.	**9 Hours** **6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total 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

24CSI103	COMPUTER GRAPHICS (Common to AD, CS, IT)	L	T	P	J	C
		2	0	2	0	3
BS		SDG	9			

Pre-requisite course	24PHI101/Applied Physics for Computing	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	identify and differentiate between various types of 2D graphics, including raster and vector formats.
2	apply key design principles to create and manipulate vector graphics using industry-standard tools.
3	explain the stages of the 3D graphics pipeline, from modelling to rendering.
4	demonstrate proficiency in 3D object manipulation and sculpting by creating fully rendered 3D models.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	develop a comprehensive understanding of 2D and 3D graphics principles by creating a project that integrates graphics and basic 3D models.	U
CO 2	apply graphics software tools to create and manipulate 2D and 3D graphics and understand the various techniques for 3D modelling.	Ap
CO 3	apply advanced design principles and techniques to develop aesthetically pleasing and functional graphic compositions, in both 2D and 3D environments.	Ap
CO 4	analyse and evaluate the effectiveness of graphic designs by assessing the application using Modelling and sculpting.	An

	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	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2												
2	3	2			3							2	
3			1		3							3	
4	3	2			3							3	

Course Content

Concepts of 2D Graphics and Digital Imaging Importance of 2D Graphics Types of 2D Graphics: Raster vs. Vector, Introduction to Graphics Software, Understanding Pixels and Resolution, Color Models: RGB, CMYK, Grayscale, Common Raster Formats: JPEG, PNG, BMP.	**4 Hours**

Vector Graphics: Design Principles and Techniques Vector Graphics Basics & Design Principles and Techniques: Vector vs. Raster: Differences and Use Cases, Paths, Anchors, and Control Points, Primary, Secondary, and Tertiary Colours, Color Harmony, Contrast, and Balance, Basics of Typography Fonts, Choosing and Pairing Fonts, Image Cropping, Resizing, and Scaling, Clipping Masks, Filters, and Effects, Working with Transparency and Alpha Channels. Case study: OpenGL and WebGL for graphics. **Practical Component** 1. Creating a Pixel Art Character 2. Design a Vector Logo 3. Apply Image Manipulation Techniques	**8 Hours** **8 Hours**
Exploring 3D Graphics: Key Applications and Workflow Key Applications of 3D Graphics: Games, Animation, VR/AR, Understanding the 3D Pipeline: Modelling, Texturing, Lighting, Rendering, Introduction to 3D Software Tools ,3D Space and Axes: X, Y, Z -Viewports, Cameras, and Perspective in 3D, Navigation Tools: Panning, Zooming, Rotating Views. **Practical Component** 1. Create a Custom Texture for a 3D Object	**6 Hours** **4 Hours**
3D Object Manipulation and Transformation Techniques Working with Objects and Transformations, Types of 3D Objects: Primitives (Cube, Sphere, Cylinder, etc.), Basic Object Manipulation: Move, Rotate, Scale, Understanding Local vs. Global Transformations – Mesh-Faces, Edges, and Vertices - Editing Meshes: Edit Mode vs. Object Mode - Extrusion, Loop Cuts, and Extrusion tools**.** **Practical Component** 1. Model a Simple Object Using Primitives 2. Extrude and Shape a Simple 3D Model	**6 Hours** **8 Hours**
Advanced 3D Modeling, Sculpting, and Texturing Methods Modelling & Sculpting, Modifiers: Subdivision Surface, Mirror, Solidify, Using Modifiers for Efficient Modelling, Combining Modifiers to Create Complex Shapes, Basic Sculpting Tools and Brushes, Use Sculpting vs. Traditional Modelling. Materials: Basic Shaders: Diffuse, Glossy, and Transparency, Applying and Editing Basic Materials on Objects Mapping, Creating and Editing UV Maps, Applying 2D Textures to 3D Objects. **Practical Component** 1. Apply Materials to a 3D Object 2. Sculpt a Simple Organic Shape 3. Model a Low-Poly Character. 4. Create a UV Map for a 3D Object. 5. Design and Apply a Texture to a 3D Object	**6 Hours** **10 Hours**

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

Learning Resources

Reference books

1. David J. Eck, Hobart and William Smith," Introduction to Computer Graphics"2016.
2. John M. Blain," Complete guide to blender graphics computer modelling & animation" 2022.
3. Donald Hearn M. Pauline Baker, "Computer Graphics - C Version", 2nd Edition, Pearson Education, 2011.
4. F.S.Hill, "Computer Graphics using OPENGL", Second edition, Pearson Education,2003.

Online Resources (Web Links)

1. https://www.coursera.org/specializations/game-design-and-development
2. https://www.coursera.org/learn/biomedvis/home/week/2

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)**
Ramesh Kumar K Sr.Technical Consultant -Xr Ark Solutions	-		Dr.K.Saranya Department of Computer Science Engineering
Recommended by BoS on	16.08.2024		
Academic Council Approval	No:27	**Date**	24.08.2024

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

	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	2												
2	3											3	
3				3								3	
4			3									3	

Course Content

INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS 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	**6 Hours**

Practical Component Implementation of List ADT using arrays	**4 Hours**
LINEAR DATA STRUCTURES 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). **Practical Component** Implement the applications of Linear Data structures	**12 Hours** **8 Hours**
NON-LINEAR DATA STRUCTURES 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). **Practical Component** Implement the applications of Non-Linear Data structures	**12 Hours** **8 Hours**
SORTING AND SEARCHING ALGORITHMS 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. **Practical Component** Implement the Sorting and searching Algorithms	**12 Hours** **8 Hours**
HASHING TECHNIQUES Hashing: Hash Functions, Collision Resolution Techniques, Linear probing, Quadratic probing, random probing, Double hashing and rehashing, Hashing Applications. Memory Management: Garbage Collection **Practical Component** Implementation of Hash Table	**3 Hours** **2 Hours**

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

Learning Resources

Textbooks

1. Horowitz, Ellis, Sartaj Sahni, and Susan Anderson-Freed. Fundamentals of Data Structures in C. Universities Press, Hyderabad (2021).
2. Tenenbaum, Aaron M., Yedidyah Langsam, and Moshe J. Augenstein. Data Structures Using C. Pearson, New York (2021).
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).
2. Mehlhorn, Kurt, and Peter Sanders. Algorithms and Data Structures: The Basic Toolbox. Springer, Berlin (2011).
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
2. https://www.oreilly.com/library/view/data-structures-and/9780133437483/
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

24CSI105	EMBEDDED COMPUTING SYSTEMS (Common to AD, CS, IT)	L	T	P	J	C
		2	0	2	0	3
ES		SDG	9			

Pre-requisite course	24CSI102 - Digital Logic Circuits	Data Book / Code book (If Any)	-

Course Objectives:

The purpose of taking this course is to:

1	understand the architecture and design challenges of embedded systems and microprocessors, with a focus on microcontrollers like the 8086 and 8051.
2	gain expertise in embedded programming techniques, including interrupt handling, firmware development, and sensor integration.
3	develop practical skills in prototyping embedded systems using real-time operating systems and development boards.
4	design, implement, and optimize embedded applications by integrating multiple sensors and peripherals for real-world scenarios.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (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	implement communication protocols and interface microcontrollers with various sensors and peripherals to build functional embedded systems.	Ap
CO 4	experiment with microcontroller architectures and their internal components to design efficient embedded solutions that meet specific requirements.	Ap
CO 5	analyse the effectiveness of embedded system designs through prototype development, sensor fusion techniques, and perform system-level testing for accuracy.	An

	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	2												
2	3												
3	3											3	
4			3										
5		3										2	

Course Content

FUNDAMENTALS OF EMBEDDED SYSTEMS AND MICROPROCESSOR Overview of Embedded Systems: Characteristics, system architecture, and design challenges. Introduction to Microprocessors and Microcontrollers- 8086 Microprocessor Architecture-Internal operations - Addressing modes -Instruction formats (Data transfer instructions, Arithmetic instructions, Logical instructions, Branch-and-loop instructions) Interrupts: Software and Hardware interrupts **Practical Component** 1. Set up a development environment, flash the RTOS onto the microcontroller, and configure basic tasks. Verify the installation by running a simple real-time application. 2. Control an I/O connected to a microcontroller	**9 Hours** **6 Hours**
MICROCONTROLLER ARCHITECTURE 8051 Microcontroller Architecture- Internal Components- Instruction Set Architecture- I/O Ports and Peripherals- Interrupts and Interrupt Handling - Microcontroller Programming -Interfacing. Automotive-grade microcontrollers, Peripheral Interfaces: Basics of CAN, LIN, SPI, I2C for embedded communication. Introduction to RTOS. Case Study on Embedded Development Boards. **Practical Component** 1. Interfacing sensor with a microcontroller and display the sensor readings on an LCD. 2. Combine data from an accelerometer and gyroscope to estimate the orientation of a device. 3. Use interrupts to toggle an LED based on a button press.	**9 Hours** **8 Hours**
EMBEDDED PROGRAMMING Embedded Programming Fundamentals, Bitwise Operations and Port Control, Interrupt Handling, Firmware Development- Writing, testing, and optimizing firmware for embedded systems applications. **Practical Component** Develop and optimize firmware for a simple embedded application.	**7 Hours** **8 Hours**
SENSOR INTEGRATION Sensor and Actuators-Overview of temperature sensors, pressure sensors, accelerometers, gyroscopes, and actuators, applications, Sensor Fusion- Techniques for combining data from multiple sensors. System Integration and Case Studies: Developing and testing prototypes using development boards.	**5 Hours**

Practical Component 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 Hours: 30	**Tutorial Hours: 0**	**Practical Hours: 30**	**Project Hours: 0**	**Total Hours: 60**

Learning Resources

Textbooks

1. Raj Kamal, Embedded Systems- Architecture, Programming and Design, 3rd Edition (2017).
2. B. Ram, "Fundamentals of Microprocessors and Microcontrollers," Dhanpat Rai Publications, 7th Edition (2019).

Reference books

1. K.V. Shibu, Introduction to Embedded Systems, 2nd Edition (2017).
2. Sam Siewert, John Pratt, Real-Time Embedded Components and Systems with Linux and RTOS, 2nd Edition (2016).
3. Sriram Iyer, Pankaj Gupta, Embedded Realtime Systems Programming,1st Edition, (2017).
4. Subrata Ghoshal, Embedded Systems & Robots Projects Using The 8051 Microcontroller, 1stEdition (2009).

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. Abhijith C Prakash Department of IT

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

24HST102	தமிழரும் தொழில்நுட்பமும்/ TAMILS AND TECHNOLOGY	L	T	P	J	C
		1	0	0	0	1
HS		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. 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. 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. 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 கலைகளைத் தெரிந்து கொள்ளுதல். 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. 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. know agriculture and irrigation technology. Understanding Scientific Tamil and Computer Tamil.	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	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: சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள். Weaving Industry during Sangam Age - Ceramic technology - Black and Red Ware Potteries (BRW)-Graffiti on Potteries.	**3 Hours**
வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ரூ 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. 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: 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. 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. 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: அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள்- சொற்குவைத் திட்டம். 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 Hours: 15	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total 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 (Common to All branches)	L	T	P	J	C
		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	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 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 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 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
2. Introducing SolidWorks, Dassault Systems.

References:

1. Insight into Electronics
2. Microcontroller Programming with Arduino and Python
3. Fundamentals of 3D modelling

Online Resources (Weblinks)

1. Google Play store apps:
   a. https://play.google.com/store/apps/details?id=com.electronicslab
   b. https://play.google.com/store/apps/details?id=it.android.demi.elettronica
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 Director - Innovation Practicum Associate VP - Forge. Innovation	-	Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24HSP112	HOLISTIC WELLNESS-II (Common to all Department)	L	T	P	J	C
		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: • Deepening mindfulness practices for enhanced mental clarity. • Exploring different forms of meditation (e.g., guided, transcendental, movement-based). • Hands-on activity: Daily meditation practice and journaling reflections.	**6 Hours**
EMOTIONAL RESILIENCE AND MENTAL HEALTH: • Building emotional resilience through positive psychology practices. • Cognitive-behavioural strategies for managing stress and anxiety. • Hands-on activity: Developing and practicing a resilience toolkit.	**6 Hours**

SOCIAL AND ENVIRONMENTAL WELLNESS: • The impact of social connections and community on wellness. • Creating a supportive environment for personal growth. • 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. • Reflective practices for discovering life purpose and meaning. • 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. • Adapting wellness plans to life changes and challenges. • Hands-on activity: Revising and finalizing a long-term personal wellness plan.	**6 Hours**

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

	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	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 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 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 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 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 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 Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total 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 Department of Bio-Tech Dr. Arul H Department of Physics	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24CSV002	DISRUPTIVE TECHNOLOGIES (Common to AD, CS, IT)	L	T	P	J	C
		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

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)										
	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
1	2							2	3		2
2	2							2	3		2
3	1							2	3		2

Course Content

DATA SCIENCE, ANALYTICS AND VISUALIZATION 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 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 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 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 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 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 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 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 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 Hours: 30	**Tutorial Hours:**	**Practical Hours:**	**Project Hours:**	**Total 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

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

	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	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 Simple C++ programs to demonstrate control flow, arithmetic operations, and console I/O	
CLASSES AND OBJECTS 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 **Practical Component** Programs on class and object creation, object arrays, and member access	**9 Hours** **6 Hours**
CONSTRUCTORS AND INHERITANCE Constructors- Default, Parameterized, Copy Constructor , Destructors -Inline Functions, Default Arguments- Inheritance: Types -Single, Multilevel, Multiple, Hierarchical-Friend Functions- Abstract Classes **Practical Component** Demonstrate all types of inheritance along with constructors using C++	**9 Hours** **6 Hours**
POLYMORPHISM AND POINTERS Function Overloading-Operator Overloading- Unary, Binary-Rules for Overloading-constructor overloading- Pointers to Objects, this Pointer-Virtual Functions, Runtime Polymorphism **Practical Component** Programs to demonstrate compile time and runtime polymorphism along with pointers	**9 Hours** **6 Hours**
EXCEPTION HANDLING ,FILES AND GENERIC PROGRAMMING 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. **Practical Component** 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,	**9 Hours** **6 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**Practical Hours:**	**30**	**Project Hours:**	**Total Hours:**	**75**

Learning Resources*
Textbooks
1. E. Balagurusamy, Object Oriented Programming with C++, 8th Edition, McGraw Hill Education, 2021. 2. Robert Lafore, Object-Oriented Programming in C++, 4th Edition, Sams Publishing, 2002
Reference books/ Web Links
1. Bjarne Stroustrup, *The C++ Programming Language*, 4th Edition, Addison-Wesley, 2013. 2. Herbert Schildt, *C++: The Complete Reference*, 4th Edition, McGraw-Hill Education, 2003. 3. Joyce Farrell, *Object-Oriented Programming Using C++*, 4th Edition, Cengage Learning, 2008.
Online Resources
1. https://www.programiz.com/cpp-programming 2. https://www.geeksforgeeks.org/c-plus-plus/ 3. https://cplusplus.com/doc/tutorial/ 4. https://www.tutorialspoint.com/cplusplus/

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**	
-	-	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	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	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		
	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				3								2
2		2			3							3	
3	2		3										2
4		3		2								2	3
5		3	2									2	

Course Content	
INTRODUCTION TO DATABASES AND DATA MODELLING **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. **Practical Component** 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** **6 Hours**
RELATIONAL MODELLING AND DATABASE DESIGN 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. **Practical Component:** 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** **6 Hours**
PHYSICAL DATABASE DESIGN AND QUERY PROCESSING 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. **Practical Component:** Simulation of relational Algebra operations – Performing joins using Relational Algebra – Implementation of various SQL joins.	**9 Hours** **6 Hours**
TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL 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. **Practical Component:** Implement multiple transactions using SQL involving BEGIN, COMMIT & ROLLBACK – Write SQL Queries for Nested Transactions.	**9 Hours** **6 Hours**
NOSQL DATABASE MANAGEMENT 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 **Practical Component:** Creation of Database and Performing CRUD operations in NoSQL – Querying with NoSQL databases.	**9 Hours** **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		
	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	
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. **Practical Component** Intelligent Agent Simulation - Propositional Logic and Knowledge-Based Agent - First Order Logic and Inference (Chaining and Resolution)	**6 Hours**
PROBLEM SOLVING 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. **Practical Component** 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.	**9 Hours** **6 Hours**
REPRESENTING AND REASONING WITH UNCERTAIN KNOWLEDGE 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. **Practical Component** Build and evaluate a Bayesian Network for a real-world problem - Implement Hidden Markov Models (HMM) for sequence prediction tasks	**9 Hours** **6 Hours**
DECISION-MAKING 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. **Practical Component** Implement a simple MDP for decision-making in a dynamic environment - Develop a game-theoretic model for AI-based strategic decision-making	**9 Hours** **6 Hours**
ARTIFICIAL INTELLIGENCE FOR AUTOMATION 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. Introduction to Robotic Process Automation- Benefits of RPA, Components of RPA-RPA Platforms-About Ui Path. **Practical Component** 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.	**9 Hours** **6 Hours**

Theory Hours:45	Tutorial Hours:0	Practical Hours: 30	Project Hours:0	Total 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

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

	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		2	2									
2		2											
3		2									2		
4		2									2		
5		2										3	3

Course Content	
MANAGERIAL ECONOMICS & DEMAND ESTIMATION 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 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 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 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 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 Hours:45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours:45

Learning Resources
Textbooks
1. P. Geetika, P. Roy Chowdhury & P. Ghosh. Managerial Economics (3e), McGraw-Hill (2017). 2. V. G. Narayanan. An Easy Introduction to Financial Accounting: A Self-Study Guide (2020). 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). 2. C. Dougherty. Introduction to Econometrics (4e), OUP (2020). 3. Tapan K. Panda. Marketing Management: Text & Cases (3e), Excel Books (2023). 4. Mike Grigsby. Marketing Analytics: Strategic Models & Metrics, Kogan Page (2022). 5. Peter Atrill & Eddie McLaney. Financial Accounting for Decision Makers (9e), Pearson (2021).
Online Resources (Weblinks)
1. https://fulfillment.shiprocket.in/blog/demand-estimation/ 2. https://www.coursera.org/learn/uva-darden-financial-accounting 3. https://www.investopedia.com/articles/stocks/07/easycashflow.asp 4. https://handbook.flinders.edu.au/topics/2025/busn1022 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 Assistant Professor & Program Head/MBA IEV

Recommended by BoS on	09.05.2025		
Academic Council Approval	No: 28	**Date**	26.06.2025

24ITT012	APTITUDE AND REASONING -I (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

	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	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 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 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 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 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 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 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

24ADV001	PYTHON PROGRAMMING (Common to AD, CS, IT)	L	T	P	J	C
		0	0	2	0	0
VA		SDG	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 fundamental syntax and programming constructs of Python.
2	Develop proficiency in using Python's core data structures, including lists, tuples, and dictionaries, and implementing modular code with functions.
3	Understand and apply Object-Oriented Programming (OOP) principles using Python classes and objects.
4	Implement robust file I/O operations and exception handling mechanisms for building reliable applications.
5	Familiarize students with essential data manipulation libraries such as NumPy and Pandas.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO1	Construct basic Python programs using variables, data types, operators, and control flow statements.	Ap
CO2	Develop modular programs by defining functions and utilizing data structures like lists, tuples, and dictionaries for effective data management.	Ap
CO3	Apply object-oriented principles to create classes, objects, and implement inheritance to model real-world problems.	Ap
CO4	Implement file handling operations to read and write data from text and CSV files and incorporate exception handling for robust code.	Ap
CO5	Utilize NumPy and Pandas libraries to perform fundamental data manipulation, filtering, and cleaning tasks on datasets.	An

	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 Knowledg	Problem Analysis	Design/Development of	Conduct Investigations of	Engineering Tool Usage	The Engineer and The	Ethics	Individual and Collaborati	Communication	Project Management and	Life-Long Learning	PSO-1	PSO-2
1	3	2			3							3	
2	3	2	2		3	3						3	
3	3	2	3		3							3	
4	3	2	2		3							3	
5	3	2	2		3							3	

Course Content

PYTHON BASICS	6 Hours
Python syntax, Variables, Data Types (int, float, string), Type Casting, I/O, Arithmetic & Logical Operators.Conditional Statements: if, if-else, if-elif-else. Iterative Statements: for loop, while loop, break, continue.	

FUNCTIONS,STRINGS, LISTS AND DICTIONARIES Defining functions, arguments (positional, keyword), return values, Lambda functions. String handling: slicing, strip(), split().Lists: creation, indexing, methods (append, remove, sort). Tuples: characteristics, indexing, methods.Dictionaries: Key-value pairs, methods (get, keys, items, update).	**6 Hours**
OOPS CONCEPTS OOP concepts. Creating Classes and Objects, self parameter, __init__ method.Inheritance (Single, Multilevel), Method Overriding.	**6 Hours**
FILE HANDLING AND EXCEPTION HANDLING Reading and writing files, file modes (r, w, a), with statement. Working with text and CSV files. Understanding exceptions. try-except-finally, Raising custom exceptions.	**6 Hours**
PYTHON LIBRARIES Introduction to NumPy, Arrays, creation, and operations. Pandas Library: Series, DataFrames. Data Manipulation (filtering, sorting). Handling Missing Data.	**6 Hours**

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

Learning Resources

Textbooks

1. Eric Matthes, *Python Crash Course*, 3rd Edition, No Starch Press, 2023.
2. Paul J. Deitel and Harvey M. Deitel, *Python for Programmers*, 1st Edition, Pearson, 2019.

Reference

1. Al Sweigart, Automate the Boring Stuff with Python, 2nd Edition, No Starch Press, 2020.
2. Wes McKinney, Python for Data Analysis, 3rd Edition, O'Reilly Media, 2022.
3. The Python Standard Library Documentation: https://docs.python.org/3/library/

Online Resources (Weblinks)

1. https://onlinecourses.nptel.ac.in/noc24_cs83/preview
2. https://www.coursera.org/specializations/python

Assessment

MCQs, Continuous Lab Work & Evaluation, Auto-Graded Online Assignments (HackerRank, etc.)

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

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

	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	2	2											
2	2	2											
3	3		2									2	
4	3	2										2	
5	2	2										1	

Course Content

FUNDAMENTALS OF COMPUTER ORGANIZATION 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	**7 Hours**
COMPUTER ARITHMETIC Addition and Subtraction of Signed Numbers-Design of Fast Adders-Multiplication of Positive Numbers-Signed Operand Multiplication-Fast Multiplication-Integer Division-Floating Point Numbers and Operation.	**11 Hours**
BASIC PROCESSING UNIT Fundamental Concepts - Execution of a Complete Instruction - Multiple Bus Organization - Hardwired Control – Microprogrammed Control – Microinstructions-Microprogram Sequencing-Wide Branch Addressing	**9 Hours**
I/O AND MEMORY 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.	**9 Hours**
PIPELING AND PARALLEL PROCESSING 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.	**9 Hours**

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 3rd Edition, Pearson, (2017).
2. John P.Hayes, Computer Architecture and Organization, 3rd 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, 6th 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 Basics of Data Communication, Network Models: The OSI Model, TCP/IP Protocol Suite, Addressing, Transmission Media, Networking Devices, Network Topologies. **Practical Component** Demonstrate the use of network Diagnostic tools such as PING, TRACEROUTE, IPCONFIG , NSLOOKUP AND NETSTAT	**8 Hours** **6 Hours**
DATA LINK LAYER Encoding, Error Detection, Reliable Transmission, MAC Protocols, Multiple Access Protocols: Random Access, Controlled Access and Channelization. **Practical Component** 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.	**9 Hours** **6 Hours**
Network Layer 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 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. **Practical Component** 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** **10 Hours**
NETWORKS SECURITY CONCEPTS 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. **Practical Component** Implementation of substitution and transposition technique.	**9 Hours** **8 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total 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).
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).
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 (Common to AD, CS, IT)	L	T	P	J	C
		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

	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	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 OOP Basics – Java Features -Java Programming Concepts, Control statement, Arrays, Method Overloading, Abstract Classes, Inheritance, Method Overriding	**12 Hours**
PACKAGES, INTERFACES AND EXCEPTION HANDLING 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 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 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 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.
2. Kathy Sierra and Bert Bates, Head First Java, 2nd Edition, O'Reilly Media, 2005.
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.
2. Josh Long, Cloud Native Java: Designing Resilient Systems with Spring Boot, Spring Cloud, and Cloud Foundry, O'Reilly Media, 2017.
3. Craig Walls, Spring in Action, 5th Edition, Manning Publications, 2018.
4. Paul Deitel and Harvey Deitel, Java How to Program, 11th Edition, Pearson, 2017.

Online Resources

1. https://www.coursera.org/specializations/java-programming
2. https://www.edx.org/learn/java
3. https://www.codecademy.com/learn/learn-java
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

	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	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	10 Hours
Cloud Computing Basics – History – Peer to peer computing - Distributed computing – Characteristics of cloud - Pros and Cons of cloud computing – Cloud Deployment	

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 **Practical Component** 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 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. **Practical Component** 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** **10 Hours**
CLOUD COMPUTING - CHALLENGES, RISK AND MITIGATION 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. **Practical Component** Create and apply security groups in any cloud, Set user roles and permissions using Identity and Access Management.	**12 Hours** **06 Hours**
MANAGING THE CLOUD 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 **Practical Component** 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** **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.
2. Kirk Hausman, Susan L. Cook, Telmo Sampaio, " CLOUD ESSENTIALS CompTIA® Authorized Courseware for Exam CLO-001", John Wiley & Sons Inc., 2013
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.
2. Erl," Cloud Computing: Concepts, Technology & Architecture", Pearson Education, 2014
3. Srinivasan, "Cloud Computing: A Practical Approach for Learning and Implementation "Pearson Education, 2014

Online Resources

1. https://www.coursera.org/learn/cloud-computing
2. https://explore.skillbuilder.aws/learn/courses/134/aws-cloud-practitioner-essentials
4. https://www.cloudskillsboost.google/paths/11
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)
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 (Common to AD, CS, IT)	L	T	P	J	C
		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		
	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	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. **Practical Component** Introduction to Python libraries for Machine Learning-Preprocessing of dataset	**4 Hours**
REGRESSION MODELS Linear regression- Simple Regression-Least Square Estimator-Maximum Likelihood Estimator– Multiple Regression –Polynomial Regression-Performance Metrices-Bias Variance Tradeoff- Overfitting – Underfitting – Gradient descent – Regularization **Practical Component** Implementation of regression problems- Optimization of regression model	**8 Hours** **6 Hours**
CLASSIFICATION MODELS 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 **Practical Component** Implementation of classification models- Evaluation of models using performance metrices.	**12 Hours** **8 Hours**
UNSUPERVISED LEARNING 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) **Practical Component** Implementation of clustering algorithms- Identification of patterns- Detection of outliers	**10 Hours** **6 Hours**
RECOMMENDATION SYTEMS 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 **Practical Component** Implementation of Collaborative Filtering-based Recommendations- Implementation of Matrix Factorization-based recommendations- Building a Recommendation system based on item features	**8 hours** **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).
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, Foundations of Machine Learning, Second Edition, MIT Press, (2018).
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 (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

	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	3		2								3	2	
3	3					2					3	2	
4	3												

Course Content

SIMPLE AND COMPOUND INTEREST, PROBABILITY 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 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 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	**3 Hours**
NUMBER SERIES, MIXTURES AND ALLIGATIONS Missing Numbers Series, Wrong Number Series, Next Number Sequence, Alpha Numeric pattern, Number and Letter Series, Rule Alligations, Replacement Problems, Mixture Concentration.	**3 Hours**
CALENDAR, CLOCKS, PUZZLES Day, Date, and Year Identification Problems, Clocks – Mirror image, Angle Calculations, Odd one out, Pattern recognition, Box-based puzzles Floor-based puzzles	**3 Hours**

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