

KUMARAGURU COLLEGE OF TECHNOLOGY,

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049.

B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

REGULATION 2024



I to IV Semesters (2025 Batch Onwards)

**Department of Artificial Intelligence and Data
Science**


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VISION

To embark as a school of innovation in the stream of data science for enabling global education, research and entrepreneurship.

MISSION

- Hone students to excel in the traits of data science technology and professionalism
- Empower students to develop solutions for mutated technological problems of the society
- Inculcate industrial and entrepreneurial culture for their professional furtherance

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates of this program shall have:

1. A successful professional career in industry, government, and academia with capabilities to build innovative solutions using technology as a tool to solve real-world problems.
2. Research capabilities in advanced technologies and shall contribute to a new body of knowledge.
3. A learning mindset to continuously improve their knowledge, through on the job, formal and informal learning opportunities.
4. An ethical attitude and shall exhibit effective skills in communication, management, teamwork and leadership.
5. Engineering, problem-solving and critical thinking skills to create social, economical and sustainable impact.

PROGRAM OUTCOMES (POs)

Graduates of the Artificial Intelligence and Data Science 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.



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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.

PROGRAM SPECIFIC OUTCOMES (PSOs)


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The Program Specific Outcomes of Artificial Intelligence and Data Science Undergraduate Program are:

PSO 1: Apply the principles of Artificial Intelligence and Data Science, to develop sustainable, data driven decisions for domain-specific applications using standard practices.

PSO 2: Demonstrate the ability to develop innovative solutions and address complex industry challenges utilizing emerging AI trends, tools, and technologies.



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KUMARAGURU COLLEGE OF TECHNOLOGY									
ARTIFICIAL INTELLIGENCE AND DATA SCIENCE									
REGULATION 2024									
B.Tech. Artificial Intelligence and Data Science – Curriculum									
2025 Batch Structure									
Semester I									
S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HST103 / 24HST104	Effective Communication / Professional Communication	Theory	HS	2	0	0	0	2
	24HSJ102	Fluency Through Practice	Practical	HS	0	0	0	4	
2	24MAI114	Applied Linear Algebra and Calculus	Embedded	BS	3	0	2	0	4
3	24PHI101	Applied Physics for Computing	Embedded	BS	3	0	2	0	4
4	24CSI006	Programming in C	Embedded	ES	1	0	6	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	VA	2	0	0	0	0
Total Credits									21
Total Contact Hours/week									30
Semester II									
S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HSP005	Mastering Conversations	Practical	HS	0	0	2	0	1
2	24MAI124	Multivariate Calculus and Forecasting	Embedded	BS	3	0	2	0	4
3	24CSI007	Python for Computational Problem Solving	Embedded	ES	1	0	4	0	3
4	24ITI001	Embedded Systems for IoT	Embedded	ES	2	0	2	0	3
5	24ADT015	Finance, Economics and Marketing	Theory	HS	3	0	0	0	3
6	24HST102	Tamils and Technology	Theory	HS	1	0	0	0	1
7	24INP103	Innovation Practicum- 2	Practical	ES	0	0	2	0	1
8	24HSP112	Holistic Wellness-2	Practical	HS	0	0	2	0	1
9	24INO102	FCLF- General Stack-2	Practical	OE	0	0	2	0	1
10	24INP101	Design Thinking	Practical	HS	0	0	2	0	1
Total Credits									19
Total Contact Hours/week									28
Semester III									



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S.N o	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	24HSP006	Mastering Group Discussion and Presentation Skills	Practical	HS	0	0	2	0	1
3	24CSI024	Data Structures and Algorithms	Embedded	PC	2	0	4	0	4
4	24CSI025	Object Oriented Programming	Embedded	PC	1	0	4	0	3
5	24ADI016	Foundations of Artificial Intelligence	Embedded	PC	3	0	2	0	4
6	24ADI204	Data Science and Visualization	Theory	PC	2	0	0	2	3
7	24INP201	Innovation Practicum- 3	Practical	ES	0	0	2	0	1
8	24INOXY	FCLF- General Stack-3	Practical	OE	0	0	2	0	1
9	24INM201	Universal Human Values-II	Theory	HS	1	0	0	0	1
Total Credits									22
Total Contact Hours/week									29
Semester IV									
S.N o	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24MAT244	Random Process and Optimization	Theory	BS	3	0	0	0	3
2	24HSP007	Building Professional Readiness	Practical	HS	0	0	2	0	1
3	24CSI009	Database Management Systems	Embedded	PC	3	0	2	0	4
4	24CSI011	Computer Networks and Security	Embedded	PC	3	0	2	0	4
5	24CSI014	Design and Analysis of Algorithms	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	24INP202	Innovation Practicum - 4	Practical	ES	0	0	2	0	1
Total Credits									23
Total Contact Hours/week									28
Semester V									
S.N o	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24CSI015	Software Engineering and Agile Practices	Embedded	PC	3	0	0	2	4
2	24CSI026	Full Stack Development	Embedded	PC	2	0	4	0	4
3	24ADI006	Deep Learning	Embedded	PC	3	0	2	0	4
4	24ADI007	Cloud Data Analytics	Theory	PC	2	0	2	0	3
5	24HSP014/ 24HSP015/	Hindi Level 1/ French Level 1/	Practical	HS	0	0	4	0	2

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	24HSP016/ 24HSP017	German Level 1/ Japanese Level 1							
6	24-----	Professional Elective I	Embedded/ Theory	PE	2	0	2	0	3
7	24-----	OE2	Theory	OE	3	0	0	0	3
Total Credits									23
Total Contact Hours/week									31
Semester VI									
S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24-----	Generative AI Application Development and Agentic AI	Embedded	PC	3	0	2	0	4
2	24ADI009	Computer Vision	Embedded	PC	2	0	0	2	3
3	24-----	Professional Elective II	Embedded/ Theory	PE	2	0	2	0	3
4	24-----	Professional Elective III	Embedded/ Theory	PE	2	0	2	0	3
5	24-----	Professional Elective IV	Embedded/ Theory	PE	2	0	2	0	3
6	24-----	Professional Elective V	Embedded/ Theory	PE	3	0	0	0	3
7	24-----	OE3	Theory	OE	3	0	0	0	3
8	24INMXYY	Constitution of India	Theory	HS	1	0	0	0	0
Total Credits									22
Total Contact Hours/week									30
Semester VII									
S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24-----	Professional Elective VI	Embedded/ Theory	PE	2	0	2	0	3
2	24-----	Professional Elective VII	Theory	PE	2	0	2	0	3
3	24-----	Professional Elective VIII	Theory	PE	0	0	6	0	3
4	24-----	OE4	Theory	OE	3	0	0	0	3
5	24INM102	Indian Knowledge System in Science and Engineering	Theory	HS	1	0	0	0	1
6	24ADJ411	Project Phase-I	Project	PRJ	0	0	0	6	3
7	24ADJ412	Professional Internship/Certification	Project	PRJ	0	0	0	6	3
Total Credits									19
Total Contact Hours/week									24
Semester VIII									
S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C


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1	24CSJ423	Project Phase-II	Project	PRJ	0	0	0	24	12
Total Credits									12
Total Contact Hours/week									24
Grand Total Credits									161


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SEMESTER I



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24HST103	EFFECTIVE COMMUNICATION			L	T	P	J	C
				2	0	0	0	2
HS				SDG	4, 8			
Pre-requisite courses		-	Data Book / Code book (If any)			-		

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

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

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


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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)


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SA-I, SA-II, 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. Sreejana Dr. Tissaa Department of English
Recommended by BoS on	16.08.2024	
Academic Council Approval	No:27	Date 24.08.2024



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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)	6 Hours
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- reading and responding to email communication – Networking Emails - Analyzing and interpreting technical texts (Loud Reading).					
Navigating Digital Media 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).				6 Hours	
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)

SA-I, SA-II, 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

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


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24HSJ102	FLUENCY THROUGH PRACTICE	L	T	P	J	C
		0	0	0	4	2
HS		SDG		4, 9, 12		

Pre-requisite courses	NIL	Data Book / Codes / Standards (If any)	NIL
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Course Objectives:		The purpose of taking this course is to:
1	Develop professional communication skills, including technical writing, public speaking, and collaborative discourse.	
2	Foster creativity and critical thinking by producing real-world academic and professional outputs such as book chapters, journal articles, and intellectual property.	
3	Instil awareness of global and ethical communication practices, contributing to sustainability and social impact.	
4	Enhance students' language fluency through project-based learning relevant to engineering	

Course Outcomes:		After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Analyze and apply effective communication techniques in professional contexts.		An
CO 2	Collaborate in teams to design and execute language-based projects with real-world applications.		Ap
CO 3	Develop critical thinking and problem-solving skills through research, analysis, and presentation of technical content.		An
CO 4	Produce publishable-quality written and spoken outputs, such as book chapters, journal articles, and copyrighted content.		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	PSO-1	PSO-2
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	1			3	2	2	1	2		
2		3	2	1			3	2	2	1	2		
3		2	2	2			3	2	2	1	2		
4		3	1	1			3	2	2	1	1		

Course Content	
Introduction to Activity Based Learning Research and Initial Project Planning	60 Hours


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Technical Writing and Documentation Creative Writing Drafting and Editing Techniques Teamwork and Peer Collaboration Public Speaking and Presentation Skills Challenges to Opportunities Cross-Cultural Communication and Global Ethics Intellectual Property and Copyrighting Publication – English for research Writing Digital Communication & Social Responsibility	
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Theory Hours:	Tutorial Hours:	Practical Hours:	Project Hours:	60	Total Hours:	60
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Learning Resources	
Reference books	
1. Mahesh Kumar, Dr.Soma. Soft Skills: Enhancing Personal and Professional Success, McGraw Hill, 2023. 2. Maxwell, John C. Developing the leader within you, Harper Collins, 2018. 3. Ansarian, Loughman, and Teoh, Mei Lin. Problem-based Language Learning and Teaching: An Innovative Approach to Learn a New Language. Singapore, Springer Nature Singapore, 2018. 4. Savin Baden, M., Major, C. H. (2004). Foundations of Problem Based Learning. United Kingdom: McGraw-Hill Companies, Incorporated.	
Online Resources	
1. https://www.sciencedirect.com/science/article/pii/S2590291123002735 2. https://www.cal.org/adultesl/pdfs/problem-based-learning-and-adult-english-language-learners.pdf 3. https://www.apu.ac.jp/rcaps/uploads/fckeditor/publications/polyglossia/Polyglossia_V16_Ng.pdf	

Assessment	
Formative	Summative
Assignments, Quiz, Library Record, Draft submission, Oral Presentation	Project Review

Course Curated By		
Expert(s) from Industry	Expert(s) from Higher Education Institutions	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. SG Mohanraj

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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



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	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	9 Hours


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Differentiation: Mean Value Theorem-Maxima and Minima – Integration: Arc Length, Area between two curves, Area of a Surface of Revolution, Volume of solids					6 Hours				
Practical Component First and second derivatives of a given function, area between two curves and the volume of a solid of revolution Optimization problems in single variables.									
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					9 Hours				
Practical Component Computing partial derivatives of multivariable functions Optimization problems in multiple variables									
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.					9 Hours				
Practical Component Solution of first order ordinary differential equations. Solution of second and higher order ordinary differential equations									
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”, 10 th 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									



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Assessment (Embedded course)
SA-I, SA-II, 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


Signature of the BOS Chairman, AI&DS

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)	-
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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

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	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 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 - 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	9 Hours 6 Hours
Quantum physics Introduction to Quantum Mechanics- Wave Particle duality- Heisenberg uncertainty principle- Wave function- Postulates of Quantum Mechanics- Schrodinger's Equations - Particle in a box- Eigen values and Eigen function- Quantum confinement – quantum wells, wires and dots – Quantum system for information processing - quantum states – classical bits – quantum bits or qubits –CNOT gate - multiple qubits – quantum gates – advantage of quantum computing over classical computing.	9 Hours


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Practical Component - Determination of band gap of a semiconductor - Determination of efficiency of solar cell - Determination of Planck's constant – Electroluminescence method	6 Hours
Thermal Physics 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.	9 Hours
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.	9 Hours
Practical Component - Compound pendulum – Determination of acceleration due to gravity - Non-uniform bending – Determination of Young's modulus	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.	9 Hours
Practical Component Melde's string – Determination of frequency of a tuning fork	6 Hours

Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	75
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Learning Resources	
Textbooks	
- Optics, Light, and Lasers: The Practical Approach to Modern Aspects of Photonics and Laser Physics, Dieter Meschede, 3rd Edition, Wiley, 2017. - Quantum Mechanics, David H. McIntyre, Cambridge University Press, 2022. - Introduction to Quantum Control and Dynamics, Domenico D'Alessandro, 2nd Edition, Chapman and Hall/CRC, 2021. - Shames, Irving H. Engineering mechanics statics and dynamics. 2022. - Engineering Mechanics: Dynamics, James L. Meriam, L. G. Kraige, J. N. Bolton, John Wiley & Sons, 2020.	


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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)
SA-I, SA-II, 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

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24CSI006	PROGRAMMING IN C	L	T	P	J	C
		1	0	6	0	4
ES		SDG		9		

Pre-requisite courses	NIL	Data Book / Codes / Standards (If any)	NIL
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Course Objectives:	The purpose of taking this course is to:
1	Gain proficiency in logical reasoning and problem-solving using algorithms and flowcharts.
2	Acquire knowledge of fundamental programming constructs in C, including data types, variables, control structures, and input/output operations.
3	Attain the capability to address real-world problems by utilizing arrays, strings, and modular programming with functions.
4	Introduce concepts of pointers, storage classes, and structures as tools for effective data representation and management.
5	Provide hands-on experience in building C-based applications that incorporate file operations, debugging strategies, and best coding practices.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Illustrate the algorithmic problem-solving techniques using flowcharts and pseudocode.	U
CO 2	Solve computational problems by applying decision-making constructs and iterative controls using basic C programming.	Ap
CO 3	Apply arrays, strings, and functions to solve programming challenges using modular programming.	Ap
CO 4	Utilize pointers, storage classes, and structures for efficient data manipulation and memory management, incorporating file operations in problem-solving scenarios.	Ap
CO 5	Apply debugging techniques and tools to identify, trace, and correct syntax, logical, and runtime errors in C programs.	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	2				2							3	


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

<u>Course Content</u>													
INTRODUCTION TO PROBLEM SOLVING AND C BASICS Introduction to computer problem-solving – The problem-solving aspect- Top-down design -Building blocks, pseudocode notation, flowcharts – Implementation of algorithms –Simple algorithmic problem-solving scenarios – C programming: data types, variables, operators and expressions, input and output operations, control flow using if and switch statements. Practical Component Drawing flowcharts, writing pseudocode for algorithmic problem scenarios, Programs using arithmetic, logical, and relational operators, Simple logic-based programs using conditionals												6 Hours	
ARRAYS AND STRING Looping and Control Statements: for, while, break, continue -Nested Loops - Defining an array - Processing an array - Multidimensional Arrays-Character Arithmetic - Defining a string - NULL character - Initialization of Strings - Reading and Writing Strings - Processing Strings -Searching and Sorting of Strings. Practical Component Pattern printing using loops - Programs for defining and processing 1D and 2D arrays, Searching (linear and binary search), Sorting (bubble sort, selection sort), Matrix operations (addition, subtraction, transpose), String handling with/without standard functions												12 Hours	
FUNCTIONS AND STORAGE CLASSES Defining a function - Accessing a function - Function prototypes -User defined Function – Actual and Formal parameters - Passing arrays to functions - Function with string - Recursion - Storage classes Practical Component Programs using functions with arguments and return values, Recursive functions (e.g., factorial, Fibonacci, sum of numbers), Passing arrays and strings to functions, Programs demonstrating storage classes: auto, static, extern, register												6 Hours	
POINTERS, STRUCTURES AND UNIONS Pointer Fundamentals - Pointer Declaration - Passing Pointers to a Function, call by value, call by reference- Pointers and arrays - Operations on pointers - Dynamic memory allocation- Structures and Unions: Defining a Structure - Processing a Structure - User defined data types (Typedef) -Unions												12 Hours	
												6 Hours	

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Assessment (Embedded course)
MCQ, Experimental Cycle tests and End Semester Examination (Lab)

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


Signature of the BOS Chairman, AI&DS

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

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	PSO-1	PSO-2
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	3												
2			3									3	
3			3									3	
4	3	2											

Course Content

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

SA-I, SA-II, 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



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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 மமமபுழ மற்றம் இலக்கயத்தன் அடப்பட அம்சங்கட அறம கப்பட த்ததல், அதன் மமதபுன்மைக்கமகபலம் மதல் நவனமகபலம் வடயை மலபுன் ட வர்ச்சயை வடக்கம் மசய்யதல். Introduce students to the foundational aspects of Tamil language and literature, tracing its evolution from ancient to modern times.
2	தமிழகத்தன் மசுழ மையபுன் கமலப்ச்மசுபுட மபுட ம்பரியத்தை அறம கப்பட த்ததல், மபுற ஓவயக் கணயல ரந்த நவன சற்ப கணயன்பட அதன் கணை மட வப்மபுட கட டை மப்ய்தல். Familiarize students with the rich cultural heritage of Tamil Nadu, exploring its artistic expressions from rock art paintings to contemporary sculptures.
3	தமிழகத்தன் மநபுண்ட ப்பறக் கணைகள் மற்றம் வட வடமையபுண்ட கட அறதல்- தணைக்ககபுண்ட கட ள கரப்ய்தல்- இந்தய கதசய இயக்கத்தல் தமிழர் கன் பங்க ளன அறதல். 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 மமமபுழ மற்றம் இலக்கயத்தன் அடப்பட அறணை மமம்பட த்ததல். மகமபுழ பண்கபுண்டல் எவ்வகபுற இட ளந்த ள்ட த என்பளத ட ரைதல். Enhance the fundamental knowledge of Tamil language and literature	U
CO2	பழங்ககபுல கபுட ள ஓவயங்கள், சற்பம் என களலகள் நவன ககபுலம்வளர எவ்வகபுற பட யக்கட த என்பளத பரிந்த மமகபுள்ள தல். Understand the heritage, rock art paintings to modern art sculpture	U
CO3	மநபுண்ட ப்பறக் களலகள் தற்மகபுப்பக் கணை ககபுலம், ணை ககரபுக்க யத்தன் கமம்பட த்தம் வதகமபுலம் அளமவளத ட அரிந்த களலகள் மகதபுன் ர்வத்தன் அதகரிக்கச் மசய்தல்- தமிழர் கன் அகத்த ட ள, பட த்த ட ள ககபுண்ட ளன பரிந்த மககபுள்ள தல். இந்தய பண்கபுண்டல் தமிழர் கன் பங்ட கப்ளப ட அதல். 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



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	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

மமமழ மற்ற ம் இலக்க யம்

இந்த ய மமமழக் கட ம்பங்கள் - தகரவட மமமழகள் - தமழ் ஓர் மசம்மமமழ - தமழ் மசவ்வலக்கயங்கள் - சங்க இலக்கயத்தன் சமய கசர்பற்ற தன்ளம - சங்க இலக்கயத்தல் பகர்தல் அறம் - தரக்கடறல் கமகலண்டளமக் கரத்தக்கள் - தமழ்க் ககப்பயங்கள், தமழகத்தல் சமண மமபித்த சமயங்ட கன் மமதபிண்கம் -பக்த இலக்கயம், ழகவரிகள் மற்றம் கநபயன்கமரிகள் - சற்றலக்கயங்கள் - தமழல் நவன இலக்கயத்தன் டவர்ச்ச - தமழ் இலக்கய டவர்ச்சயல் கபிட தகயர் மற்றம் கபிரதகத்சன் கககயரின் பங்டகப்ப.

3 Hours

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.

மரப - பஹற ஓவயங்கள் மதல் நவன ஓவயங்கள் வறர - சற்பக்கறற

நடகல் மதல் நவன சற்பங்கள் வளர - ஐம்மமபின் சளலகள்- பழங்கடயனர் மற்றம் அவர்கள் தகயரிக்ம் எகவளனப் மகபரிகள், மமபிம்ளமகள் - கதர் மசய்யம் களல - சடமண் சற்பங்கள் - கநபிண்டப்பற மதய்வங்கள் - கமரிமளனயல் தரவள்ளவர் சளல - இளசக் கரவகள் - மரதங்கம், படள, வடள, கயழ், கநபிஸ்டவம் - தமழர்டகன் சமக மமபிரட கபகதபட கவழ்வல் கககவல்டகன் பங்க.

3 Hours

HERITAGE – ROCK ART PAINTINGS TO MODERN ART SCULPTURES

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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.					
நாட்டப் பறக் கற நகள் மற்றம் வர வற றயட்ட கள் மதரக்கத்த, டகககட்டம், வல்லப்கபட்ட, கணிகயபன் கத்த, ஓயகலட்டம், ககதப்கபட்டவக்கத்த, சலம்கபட்டம், டவரி, பலகயபட்டம், தமழர்டகன் வடளகயபட்டகள்.					
FOLK AND MARTIAL ARTS Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Ciabatta, Valari, Tiger dance - Sports and Games of Tamil					
தமழர்களின் தற நக்ககட்டபட்ட கள் தமழகத்தன் கதட்டவங்களம், வலங்ககளம் - மமதப்ககபட்டயம் மற்றம் சங்க இலக்கயத்தல் அகம் மற்றம் பறக்ககபட்டமபட்டகள் - தமழர்கள் ககபட்டறய அறக்ககபட்டபட்ட - சங்கககபட்டத்தல் தமழகத்தல் எழத்தறவம், கல்வயம் - சங்கககபட்ட நடகங்களம் தடளமகங்களம் - சங்கககபட்டத்தல் ஏற்றமத மற்றம் இறக்கமத - டகல்டகந்த கதட்டகல் தமழர்டகன் மவற்ற.					
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.					
இந்தய கதசய இயக்கம் மற்றம் இந்தய பண்பட்டற்கத் தமழர்களின் பங்களிப்ப இந்தய வடதளப ககபட்டரில் தமழர்டகன் பங்க - இந்தகயபவன் பறப்பகதடகல் தமழ்ப் பண்கபட்டன் கதப்ககம் - சயமரிகயபளத இயக்கம் - இந்தய மரத்தவத்தல், சத்த மரத்தவத்தன் பங்க - கல்மவண்டகள், ளகமயழத்தப்படகள் - தமழ்ப் பத்தகந்டகன் அச்சடவகலபற.					
CONTRIBUTIONS OF TAMIL TO INDIAN NATIONAL MOVEMENT 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.					
Theory Hours: 15	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 15	
Learning Resources					
Reference books:					
1. தமழக டவகலபற - மக்களம் பண்கபட்டம் - கக.கக. பள்ள (மடவயட: தமழ்குநட்ட கபட்டணல் மற்றம் கல்வயயல் பணிகள் கழகம்). 2. கணினித்தமழ் - மளனவர் இல. சந்டதம். (வடகன்படசடம்). 3. கழட - ளவளக நதக்களரயல் சங்கககபட்ட நடக கநப்கரிகம் (மமதப்கலயல் தடளமடவயட) 4. மமபபரளந - றறங்களர கநப்கரிகம். (மமதப்கலயல் தடளமடவயட) 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.					



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7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu 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 Book and 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/1pf0jbyuDTNdvlcKMnOf0Pjbqha7JqdOc/edit#slide=id.p1>
4. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e&index=1

Assessment (Theory course)

SA-I, SA-II, 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



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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)	-
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Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes:

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

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

Course Content

Engineering Fundamentals and Innovation Why engineering? The concept of street fight engineering - Real-world design process and problem-solving methodology - Data-driven insights and concept generation - Case studies of successful engineering innovations.	3 Hours
Transdisciplinary Systems and Manu'Futuring	6 Hours


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Transdisciplinary systems to accelerate innovation - Manu'Futuring: Technology in hardware manufacturing and manufacturing of hardware technologies - Future scopes with product case studies.		
Building Custom Hardware 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 - <u>Street Fighting Mathematics</u>
2.	Donald Knuth - <u>The Art of Computer Programming</u>
3.	Think like a programmer: <u>An introduction to creative problem solving</u>
4.	Thinking in Systems: <u>A Primer</u>
References:	
1.	Learning to code: <u>How to think like a programmer</u>
2.	How to find innovative ideas: <u>Ramesh Raskar's note</u>
3.	Case study: <u>How Tesla changed the auto industry</u>
4.	Ultimate Guide: <u>How to develop a new electronic hardware product</u>
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


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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


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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	

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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



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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.
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Course Outcomes

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

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

Course Content

EDUCATION LMS – LCMS – MOOC - Coursera equivalent for Indian languages - LLMs for educational content & answering queries of learners - Multiple Intelligence skills -	3 Hours
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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 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			


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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


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Semester – II



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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)	-
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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


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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 - Conversation Building through communicative functions-Initiating a dialogue- Framing questions- Receiving feedback		6 Hours		
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: 0	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 30

Learning Resources	
Reference books	
1. Bonwell, C. C., & Eison, J. A. (1991). Active learning: Creating excitement in the classroom. Washington, DC: The George Washington University. 2. Harbour, E., & Connick, J. (2005). Role playing games and activities rules and tips. Retrieved from https://www.businessballs.com/roleplayinggames.htm	

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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



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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



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	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).	9 Hours 6 Hours



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Practical Component - Fitting polynomials curve by Least Square method. - Fitting non-linear curves by Least Square method.									
TIME SERIES Time series – Components of Time series – Construction of Time series – Measurement of Trend: Determination of trend by moving averages – Measurement of Seasonal Variations: Method of Simple Average, Ratio to Trend Method and Ratio to moving average method.					9 Hours				
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					9 Hours				
Practical Component - Numerical Differentiation - Newton’s divided differences. - Numerical Integration using Trapezoidal and Simpson’s rule.					6 Hours				
Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	75
Learning Resources									
Textbooks									
- Kreyzig E., “Advanced Engineering Mathematics”, 10th Edition, John Wiley and sons, 2023 A. Montgomery D.C., Johnson. L.A., Gardiner J.S., “Forecasting and Time series Analysis”, McGraw Hill, 1990 - Gerald, C. F. and Wheatley, P. O., “Applied Numerical Analysis”, 7th Edition, Pearson Education Asia, New Delhi - Numerical Methods for Scientific and Engineering Computation by M.K. Jain, S.R.K.Iyengar and R.K. Jain, New Age International Publishers 2007. - Gupta S.C and Kapoor V.K, “Fundamentals of Mathematical Statistics”, 11th extensively revised edition, Sultan Chand & Sons, 2007.									
Reference books									
- Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2014. - Weir, MD, Hass J, Giordano FR: “Thomas’ Calculus”, Pearson Education, 15th Edition, 2023 - Kandasamy P., Thilagavathy K. and Gunavathy K., “Numerical Methods”, S. Chand Co. Ltd., New Delhi, 2007. - David C. Lay, “Linear Algebra and its Applications”, Pearson Education Asia, New Delhi, 6th Edition, 2021 - Anderson, T. W, “An Introduction to Multivariate Statistical Analysis”, John Wiley and Sons, 2003.									
Online Resources (Web Links)									
Double and Triple Integrals (Khan Academy): https://www.khanacademy.org/math/multivariable-calculus/integrating-multivariable-functions									



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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			
SA-I, SA-II, 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

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24CSI007	PYTHON FOR COMPUTATIONAL PROBLEM SOLVING (Common to AD, CS, IT)		L	T	P	J	C	
			1	0	4	0	3	
ES			SDG	9				
Pre-requisite courses			NIL	Data Book / Code book (If any)		NIL		

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce the basics of Python, including data types, operators, and control structures, with a focus on practical implementation.
2	Develop proficiency in iterative statements, string handling, and fundamental data structures like lists, tuples, and dictionaries through extensive lab work.
3	Provide foundational knowledge on modules, functions, object-oriented programming (OOP) concepts, and file handling.
4	Familiarize students with exception handling and Python's standard libraries like NumPy and Pandas for data manipulation.
5	Enable students to apply Python concepts to solve real-world problems through practical, hands-on experiments.

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

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


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Course Content	
Python Basics and Control Structures Python Basics: Python syntax – Variables - Data Types - Type Casting - Arithmetic & Logical Operators. Conditional Branching Statements: if, if-else, if-elif-else, nested conditions. Iterative Statements: for loop, while loop, Loop Control Statements. Practical Component: Implement basic Python programs to demonstrate data types, operators, and input/output operations. Develop programs using all forms of conditional statements. Write extensive Python scripts using for and while loops to generate complex patterns, various series like Fibonacci, arithmetic progression, and solve simple mathematical/logical problems.	3 Hours 12 Hours
Python Functions, Strings, and Data Structures Defining functions, Function arguments - Return values - Anonymous Lambda Functions. Modules - built-in and user-defined modules - String Handling: String slicing, concatenation, formatting, and methods-List: Creating lists- List indexing- List methods - List comprehension. Tuple - Characteristics of tuples- Tuple indexing, Tuple methods. Dictionary: Key-value pairs, Dictionary methods. Sets in Python: Create, Add, Remove with Examples. Python Regular Expressions (RegEx) basics. Practical Component: Create Python scripts to demonstrate advanced string manipulation techniques, including RegEx for basic pattern matching. Perform complex operations on lists, tuples, sets, dictionaries, and combinations of all datatypes using various methods. Develop and utilise user-defined modules.	3 Hours 12 Hours
Object-Oriented Programming OOP concepts - Creating classes and objects - Self parameter - init method. Inheritance & Polymorphism: Types of inheritance, Method Overriding - Concept of Method Overloading in Python. Practical Component Develop a robust OOP-based application to practically demonstrate the core concepts: creating multiple classes and objects, implementing all major types of inheritance, and showcasing polymorphism through method overriding. Implement a solution to simulate method overloading using variable arguments or default parameters.	3 Hours 12 Hours
File Handling and Exception Handling File Handling: Reading and writing files, File modes - Working with text and CSV files. Exception Handling: Understanding exceptions - Handling exceptions using try- except-finally - Raising custom exceptions. Practical Component: Read and write large amounts of data to text and CSV files using different Python file handling modes. Create a practical utility that processes data from a file, writes results to another file, and is fully protected using robust exception handling. Implement and raise meaningful custom exceptions for validation or specific error conditions.	3 Hours 12 Hours
Python Libraries -Numpy and Pandas NumPy Library: Introduction to NumPy, Arrays, Array creation and manipulation, Array operations. Analysing different pipeline structures involving storage - processing, ML components based on requirements. Pandas Library: Series: Creating Series – Indexing - Operations on Series. DataFrames: Creating DataFrames, Data Manipulation. Handling Missing Data: dropna(), fillna(), isnull() functions.	3 Hours 12 Hours



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Practical Component: Perform an extensive array creation, manipulation, and mathematical operations on NumPy arrays. Manipulate real-world or mock datasets using Pandas Series and DataFrames, including data cleaning, filtering, sorting, and handling missing values using appropriate functions.	
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Theory Hours:15	Tutorial Hours:0	Practical Hours: 60	Project Hours:0	Total Hours:75
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Learning Resources
Textbooks
1. Mark Lutz, "Learning Python," O'Reilly Media, 6th Edition, 2025. 2. Y. Daniel Liang, "Introduction to Programming Using Python," Pearson, 1st Edition, 2017.
Reference
1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist," Green Tea Press, 2nd Edition, 2015. 2. Zed A. Shaw, "Learn Python the Hard Way," Addison-Wesley, 5th Edition, 2024.
Online Resources (Weblinks)
1. https://docs.python.org/3/tutorial/index.html 2. https://learn.microsoft.com/en-us/shows/intro-to-python-development/ 3. https://www.udacity.com/course/introduction-to-python--ud1110 4. https://www.geeksforgeeks.org/courses/python-course-certification-free 5. https://onlinecourses.nptel.ac.in/noc24_cs57/preview 6. https://www.coursera.org/projects/python-for-data-analysis-numpy

Assessment (Embedded course)
MCQ, Experimental Cycle tests and End Semester Examination (Lab)

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	29.11.2025		
Academic Council Approval	No: 29	Date	

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24ITI001	EMBEDDED SYSTEMS FOR IOT	L	T	P	J	C
		2	0	2	0	3
ES		SDG		4,9		
Pre-requisite courses		24CSI102 Digital Logic Circuits		Data Book / Codes / Standards (If any)		Nil

Course Objectives:		The purpose of taking this course is to:
1	Introduce the architecture and operational characteristics of embedded system, microprocessors and microcontroller	
2	Learn IoT architecture, ecosystem components, and communication technologies used in connected systems.	
3	Develop practical skills in Arduino and Raspberry Pi programming for sensor, actuator, and device interfacing	
4	Apply IoT concepts to design smart solutions for real-world applications such as smart cities, healthcare, agriculture, manufacturing, and home automation.	

Course Outcomes:		After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Demonstrate knowledge of embedded system architecture, the functions of microprocessors and microcontrollers.		U
CO 2	Apply IoT concepts, characteristics, and architecture to explain real-world IoT systems.		Ap
CO 3	Apply Knowledge of sensors, actuators, and selection criteria to choose suitable devices for IoT applications.		Ap
CO 4	Analyze IoT applications, communication technologies, and recent trends to design smart solutions		An

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


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<u>Course Content</u>	
INTRODUCTION Overview of Embedded System - Design Challenges - Introduction to Microprocessors- 8086 Architecture- Pin Configuration- Instruction Set- 8086 Assembly Language Programming-Interrupts -Introduction to Microcontroller- Microprocessors Vs Microcontroller- Role of microcontroller in IoT	7 Hours
Lab Components: Basic Assembly Program: ALP to perform 16-bit arithmetic operations	4 Hours
IOT Fundamentals Introduction to Internet of Things (IoT), Functional Characteristics and evolution of IoT – different layers of Architecture and their working - Elements of an IoT ecosystem- Different IoT boards, architecture - IDEs for IoT Prototyping- Programming -Structure-functions- Input and output operations- Serial communication - Libraries and code management	8 Hours
Lab Components: 1. LED Blink 2. Buzzer ON /OFF 3. Serial Communication 4. Random LED Game 5. LED pattern generator using function	8 Hours
IoT Hardware and Communication Sensors and actuators – Types and functions – Sensor characteristics – Sensor selection criteria – Actuator types and applications-Comparison of Arduino, Raspberry Pi and AI-enabled boards. Gateways in IoT- Network connectivity – Short-range Communication - Long-range communication - RaspberryPi: Introduction to RaspberryPi - Hardware Layout - Configuring RaspberryPi - Programming RaspberryPi	8 Hours
Lab Components Board (Arduino/ RaspberryPi) 1. Temperature and Humidity Monitoring 2. Measure the Distance of object 3. Detect Human motion and Turn ON LED 4. Monitor the Soil Moisture Level 5. Control LED Brightness based on Light Intensity	8 Hours
Case Studies on IOT Applications Recent Trends in the Adoption of IoT, Role of cloud in IoT. Case Studies: Smart Cities - Smart Waste Management, Smart Street Lights, Smart Street Parking. Healthcare - Baby Monitoring, Elderly Monitoring, Agriculture - Precision Agriculture, Connected Livestock, Food Safety. Manufacturing and Logistics - Smart Manufacturing- Smart Packaging, Smart Label-Home Automation.	7 Hours
Lab Component	10 Hours



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1. Smart Street Light Automation	
2. Smart Waste Bin Monitoring system	
3. Health Monitoring system	
4. Smart Home Automation	

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

Learning Resources

Reference books/ Web Links

1. "Internet of Things: A Hands-On Approach", Arshdeep Bahga, Vijay Madisetti, Publisher Universities Press, 2016
2. Douglas V. Hall, "Microprocessors and Interfacing: Programming and hardware", McGraw Hill Education, Third Edition, 2021
3. "Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry" by Maciej Kranz, ISBN: 978-1-119-28568-7, 2016.
4. "The Internet of Things: Key Applications and Protocols", Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley Publication, 2012.
5. "IOT Deployment Handbook: A practical Guide to Implementing Successful IOT Projects" By Richard G. Brown, 2022

Online Resources

1. https://onlinecourses.nptel.ac.in/noc26_cs37/preview
2. <https://www.coursera.org/specializations/iot>
3. <https://www.udemy.com/course/introduction-to-internet-of-things-iot-using-arduino/?kw=internet+of+things+usi&src=sac>

Assessment (Embedded course)

I, SA II, 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.G.Shobana , Assistant Professor Department of Information Technology Mr.M.Sathish Assistant Professor, Department of CSE
Recommended by BoS on	09.05.2025	
Academic Council Approval	No: 28	Date 26.06.2025


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

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		


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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
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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/


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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)
SA-I, SA-II, 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


Signature of the BOS Chairman, AI&DS

24HST102	தம ழர ம் ததழ ல்ந ட்பம ம்/ TAMILS AND TECHNOLOGY	L	T	P	J	C
HS		1	0	0	0	1
		SDG		4, 8		
Pre-requisite courses	-	Data Book / Code book (If any)			-	

Course Objectives:

The purpose of taking this course is to:

1	தம ழர்ட க ன் மநசவ மற்ற ம் கபுளனத் மகதழ ல்ந ஸ்தத் ட அிம கப்பட த்த தல், சங்க ககபுல கண்டை மகதழ ல்ந ஸ்தத் வ ட க்கதல், கககபுல கள் மற்ற ம் சற்பக்களலகட ள கரப்தல். introducing weaving and pottery technology of Tamils -Explaining the building technology of the Sangam Period-Explore temples and sculptures.
2	கப்பல், இர ம்ப, கற்புட யங்கள், ட ம ரை கவபுக்க ம் மகதழ ல்ந க்சபுளலகள், க யவற்ப ள வ ட க்கம் மசய்தல், தம ழகத்த ன் மகதபுல யல் க்சபுன்ற ட க ன் பழளமளய ட ரைத்த தல். explain Ship, Iron, Coins, Beads Making Factories. Realizing the Antiquity of Archaeological Evidence of Tamil Nadu
3	கட கவபுண்ளம மற்ற ம் ட அிவ யல் தம ளழப் பற்ப ட அிதல், இட ளயத்த ல் தம ழ ன் கதளவளய ட ரைத்த தல், தம ழ மமன்மகபுர ளகட ள ட அிம கம் மசய்தல். 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	தம ழர்ட க ன் மநசவ மற்ற ம் கபுளனத் மகதழ ல்ந ஸ்தத் ன் ம க்க யத்த வத்த ள ன ட அிந்த மககபுள ல். சங்கககபுல தம ழர் ட வர்த்த அழக க் களலகட ளத் மதரிந்த மககபுள ல். know the importance of weaving and pottery technology of Tamils-To know the Aesthetics arts developed by Sangam Tamils	U
CO 2	கப்பல் கண்டை ம் களல, இர ம்பத் மகதழ ல்ந க்சபுளல, கற்புட யங்கள் அச்சடத்தல், ட ம ரை கவபுக்க ம் மகதழ ல்ந க்சபுளலகள், ச லப்பத ககபுரத்த ல் ணை ட ட மட க ன் வளகளய ட அிதல். knowledge of ship building, ironworks, coinage, minting, and beads making factories, Knowing the types of beads in Silapathikaram.	U
CO 3	கட கவபுண்ளம மற்ற ம் நீர்ப்புர்புசன மகதழ ல்ந ஸ்தத் ட அிந்த மககபுள ல். ட அிவ யல் தம ழ மற்ற ம் ட க னித் தம ளழப் பரிந்த மககபுள ல். know agriculture and irrigation technology. Understanding Scientific Tamil and Computer Tamil.	Ap



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	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	
தநசவ மற்ற ம் பஹ றத் ததழ ல்ந ட்பம்: சங்க ககலத்த ல் மநசவத் மகதழ ல் - கபுளளத் மகதழ ல்ந ஸம் - கர ப்ப ச வப்ப கபுண்ணங்கள் - கபுண்ணங் க ல் கட ல் கட ியட கள். Weaving Industry during Sangam Age - Ceramic technology - Black and Red Ware Potteries (BRW)-Graffiti on Potteries.	3 Hours
வடவறமப்ப மற்ற ம் &ட்ட டத் ததழ ல்ந ட்பம்: சங்க ககலத்த ல் வடவறமப்ப மற்ற ம் கட்ட கமபுனங்கள் ர சங்க ககலத்த ல் வட்ட மகபுர ண் க ல் வடவறமப்ப - சங்க ககலத்த ல் கட்ட கமபுன மகபுர ண் க ல் நட கல்லம் - ச லப்பதககபுரத்த ல் கமளளஅளமப்ப பற் ிய வ வரங்கள் - கமமல்லபரச் ச ற்பங்கள ம், கககலவ ல்கள ம் - ககசழற் ககலத்த ப் மபர ங்கககபு ல்கள் மற்ற ம் பட் வழ கபுண்ட் தலங்கள் - கநபுயக்கர் ககலக் கககபு ல்கள் - கமபுரி கண்ணமப்பகள் பற் ிட அிதல், மத ளர மகனபுண் அம்மன் லயம் மற்ற ம் தர மளல கநபுயக்கர் மக டல் - மசட்டகநபுண்ட வட கள் - பரிண்ட் ககலத்த ல் மசன்னயல் இந்ககதபு-கசுபகசுபுமசனிக் கட்ட ண் களல. 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
உற்பத்த த் ததழ ல் ந ட்பம்:	


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கப்பல் கட்டும் களம் - கைகலக்கவயல் - இரம்பத் மகதழிற்சுடளம் - இரம்பப் பரக்கத், எஃக - வரகலற்றச் சுடன்ற டக்க மசம்ப மற்றம் தங்க சுநட்ட யங்கள்-சுநட்ட யங்கள் அச்சுடத்தல் - டம ரைகவர்க்கம் மகதழிற்சுடளங்கள் - கல்ட மகள், கண்ட கட்ட மகள் - சடமண்ட மகள் - சங்க ட மகள் - எலம்பத்தண்டகள் - மகதழில்லயல் சுடன்றகள் - சலப்பதக்காரத்தல் டமடகன் வளக்கள். 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										
கறவண்ணம் மற்றம் நீர்ப்பிற சத்தழிற் டபம்: அடள, ஏரி, கடங்கள், மதக - கசுழர்க்கலக் கமழ்த்தம்பன் மக்கயத்தவம்-ககில்நளை பசுமரிப்ப - ககில்நளைக்ககக வடவளமக்கப்பணைகடறகள்-கடகவண்ணம் மற்றம் கடகவண்ணம்ச் சுடர்ந்த மசயல்குடிகள் - கண்குடர் அிவ - மண்டவம் - மத்த மற்றம் மத்தக்கடித்தல் - மபரங்கண்கடித்தபண்ணைய அிவ - ட அிவசுடர் சமகம். 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										
றவியல் தமழ் மற்றம் ஃறநித்தமழ்: ட அிவயல் தமழ் ட வர்ச்ச - டகத்தமழ் ட வர்ச்ச - தமழ் டல்கடள மன்பதப்ப மசய்தல் - தமழ் மமன்மசுபரண்கள ரைகவர்க்கம் - தமழ் இடளயக் கல்வக்கழகம் - தமழ் மன் டலகம் - இடளயத்தல் தமழ் அகசுடிகள் - மசுடற்களவத்தணம். 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										
<table><tr><td>Theory Hours:</td><td>Tutorial Hours:</td><td>Practical Hours:</td><td>Project Hours:</td><td>Total Hours:</td></tr><tr><td>15</td><td>0</td><td>0</td><td>0</td><td>15</td></tr></table>	Theory Hours:	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours:	15	0	0	0	15	
Theory Hours:	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours:							
15	0	0	0	15							
Reference books 1. தமழக வரலாறு மக்களம் பண்பட்டம் கக.கக. பள்ள (வவளியட : தமழ்நட்ட பண்ணல் மற்றம் கல்வயயல் பணிகள் கழகம்). 2. கணினித் தமழ் - மளனவர் இல. சந்தரம். (வகண்பரசரம்). 3. கழட - எவளக நதக்களரயல் சங்ககல நகர நுகரிகம் (வதில்லயல் தளற வவளியட). 4. வபரளற - ற்றங்களர நுகரிகம். (வதில்லயல் தளற வவளியட). 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)											


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10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
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)

SA-I, SA-II, 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



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24INP103	INNOVATION PRACTICUM – 2 (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	PSO 1	PSO 2
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning		
1	3	2	2	2	2								
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
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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 Arduino and Raspberry Pi, exploring their capabilities and applications, Designing PCBs using KiCad and EasyEDA, Understanding PCB fabrication processes				6 Hours	
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


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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


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

Pre-requisite courses	24HSP111 / Holistic Wellness-2	Data Book / Code book (If any)	-
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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	PSO 1	PSO 2
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning		
1						2		2					
2						2							
3						2					3		
4						2					3		

Course Content	
ADVANCED MINDFULNESS 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:	6 Hours


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• Building emotional resilience through positive psychology practices. • Cognitive-behavioural strategies for managing stress and anxiety. • Hands-on activity: Developing and practicing a resilience toolkit.	
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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).	

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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


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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

6 Hours



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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.		
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	Total Hours: 30
Tutorial Hours:	0	
Practical Hours:	30	
Project Hours:	0	
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		

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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



Signature of the BOS Chairman, AI&DS

SEMESTER III



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24CSI024	DATA STRUCTURES AND ALGORITHMS		L	T	P	J	C
			2	0	4	0	4
PC			SDG		9		
Pre-requisite courses	NIL	Data Book / Code book (If any)	NIL				

Course Objectives:

The purpose of taking this course is to:

1	Provide foundational knowledge of data structures, searching and sorting algorithms, string processing techniques, and algorithm analysis for developing efficient software solutions.
2	Develop the ability to implement and analyze linear data structures such as stacks, queues, and linked lists for real-world applications.
3	Apply non-linear data structures including trees and heaps for efficient storage, searching, and data organization.
4	Analyze graph algorithms for solving complex computational and optimization problems.
5	Understand and apply hashing techniques, hash functions, and collision resolution methods for efficient data storage, retrieval, and management in computing applications.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply searching, sorting, and string processing algorithms using appropriate data structures and analyze their efficiency using asymptotic notations.	Ap
CO 2	Apply linear data structures such as arrays, stacks, queues, and linked lists for solving computational problems.	Ap
CO 3	Implement and analyze tree-based data structures including BST, AVL trees, and heaps for efficient data processing.	Ap
CO 4	Apply graph algorithms such as BFS, DFS, shortest path, and minimum spanning tree algorithms for problem solving.	Ap
CO5	Design efficient hashing techniques with suitable collision resolution methods and evaluate their performance in data storage and retrieval applications.	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		
1	3										2	2	
2	3	3	2										


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3	3	3	2		2					2	2	
4	3	3		2	2					2	2	
5	2	2									2	
INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS Theory Component: Introduction to Data Structures and Algorithms, Importance of data structures in programming and software development, data types vs data structures, Abstract Data Types (ADTs), arrays, two-pointer technique. Searching: Linear, Binary search. Sorting Algorithms: Bubble Sort, Selection sort, insertion sort. Merge sort. String algorithms . Algorithm analysis: Big O, Big Theta, Big Omega notations											6 Hours	
Practical Component Implementation of List ADT using arrays, Linear and Binary Search, Sorting, string algorithms.											12 Hours	
LINEAR DATA STRUCTURES Theory Component: Stacks: Implementation of stack and Applications (infix to postfix, expression evaluation, parenthesis matching) Queues: Implementation of Queue, Circular Queue, Applications, Linked Lists (Single, Double, and Circular linked implementation), Linked list implementation of Stack & Queue											7 Hours	
Practical Component Implementation of ADT for Linear Data structures(stack, Queue and Linked list) and it's applications.											14 Hours	
NON-LINEAR DATA STRUCTURES TREES Theory Component: Trees: Binary Trees, Binary Search Trees, Tree Traversals, AVL Trees, Heap tree.											7 Hours	
Practical Component Implementation of BST and AVL trees and heap operations.											14 Hours	
NON-LINEAR DATA STRUCTURES GRAPHS Theory Component: Graphs: Terminologies, Representation (Adjacency Matrix, List), Graph Traversal (BFS, DFS), Spanning Trees Prim's algorithm, Kruskal's algorithm, Shortest Path Algorithms (Dijkstra, Floyd-Warshall).											6 Hours	
Practical Component. Implementation of graph traversals, solve shortest path problems, implement MST algorithms.											12 Hours	
HASHING TECHNIQUES Theory Component: Hashing: Hash Functions, Collision Resolution Techniques, Linear probing, Quadratic probing, random probing, Double hashing and rehashing.											4 Hours	
Practical Component Implementation of hashing techniques and collision resolution techniques											8 Hours	


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AI Tools to be Used • GitHub Copilot • Agent Smith • ChatGPT API / LLM-assisted debugging • Online Competitive Coding Platforms • Complexity Visualizers	
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Theory Hrs: 30	Tutorial Hrs:0	Practical Hrs: 60	Project Hrs:0	Total Hrs: 90
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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/ https://www.geeksforgeeks.org/data-structures/
Assessment (Embedded course)
SA-I, SA-II, 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)
Recommended by BoS on			
Academic Council Approval		Date	


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24CSI025	OBJECT ORIENTED PROGRAMMING	L	T	P	J	C
		1	0	4	0	3
		SDG		4,9		
ES						

Pre-requisite courses	Nil	Data Book / Codes / Standards (If any)	Nil
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Course Objectives:	The purpose of taking this course is to:
1.	Understand the fundamentals of Java programming including program structure, data types, methods, and control statements.
2.	Learn object-oriented programming concepts such as classes, inheritance, polymorphism, abstraction, and interfaces.
3.	Develop skills in handling errors and working with strings and wrapper classes for efficient program development.
4.	Understand multithreading, synchronization, and file handling concepts using Java I/O techniques.
5.	Enable students to work with collections, database connectivity, and application development using Java technologies.

Course Outcomes:	After successful completion of this course, the students shall be able to	Revised Bloom's Taxonomy Level (BTL)
CO1	Apply fundamental programming and object-oriented principles to develop programs using basic programming constructs.	Ap
CO2	Implement object-oriented features such as inheritance, polymorphism, abstraction, interfaces, and packages to develop reusable programs.	Ap
CO3	Apply exception handling and string processing techniques to develop reliable and robust programs.	Ap
CO4	Construct multithreaded programs and utilize input/output techniques for file handling and data processing.	Ap
CO5	Develop database-integrated applications using collection frameworks, modern programming features, and database connectivity techniques.	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	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	2									3	
2	2		3		2							3	
3		3	2		2							3	
4	2		3		2							3	
5		2	3		2							3	


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Course Content	
JAVA FUNDAMENTALS	
Overview of Java – History, Features, and Program Structure – Compilation and Execution – Data Types, Variables, Operators, and Type Casting – Control Statements – Arrays – Introduction to OOP Concepts: Class, Object, Constructor, Encapsulation.	3 Hours
Practical Component: - Develop Java programs using data types, variables, operators, type casting, and input/output statements to solve basic computational and logical problems. - Construct Java programs using conditional statements and looping constructs to solve number-based problems, logical problems, and iterative computations. - Implement Java programs to generate various star, number, and alphabet patterns using nested loops and conditional statements. - Design Java programs using one-dimensional and two-dimensional arrays, methods, parameters, and return values to implement searching, sorting, and matrix operations. - Create Java applications using classes, objects, constructors, constructor overloading, and the 'this' keyword to model real-world entities. - Develop Java applications by implementing encapsulation using private data members, getter and setter methods, and constructors to build simple object-oriented systems.	12 Hours
OBJECT-ORIENTED PROGRAMMING	
Types of Inheritance – 'super' keyword and Constructor Chaining – Method Overriding and Runtime Polymorphism – Abstract Classes and Abstract Methods – Interfaces and Multiple Inheritance – Packages and Access Modifiers.	3 Hours
Practical Component: - Develop Java programs to demonstrate different types of inheritance, constructor chaining, and the use of the super keyword for accessing parent class members and constructors. - Implement Java programs to demonstrate method overriding, dynamic method dispatch, and runtime polymorphism using inheritance. - Design Java applications using abstract classes and abstract methods to achieve abstraction and code reusability. - Create Java programs using interfaces to implement abstraction and demonstrate multiple inheritance through interfaces. - Develop Java applications by creating user-defined packages and applying different access modifiers to control accessibility of classes, methods, and variables. - Design and implement a menu-driven Java application that integrates inheritance, polymorphism, abstraction, interfaces, packages, and access modifiers to model a real-world problem.	12 Hours
EXCEPTION HANDLING, STRINGS AND WRAPPER CLASSES	
Checked vs Unchecked Exceptions – Exception Hierarchy – try, catch, finally, throw, throws – Built-in and User-defined Exceptions – String Immutability – StringBuffer vs StringBuilder – Wrapper Classes overview – Autoboxing and Unboxing.	3 Hours
Practical Component: - Develop Java programs to demonstrate exception handling using try, catch, finally, throw, and throws statements with built-in exceptions.. - Design Java applications that create and handle user-defined exceptions for validating input and implementing application-specific error handling. - Implement Java programs using String, StringBuffer, and StringBuilder classes to perform string manipulation, comparison, searching, modification, and performance analysis. - Develop Java programs using wrapper classes, autoboxing, unboxing, parsing methods, and type conversion to process different data types.	12 Hours


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- Design and implement a menu-driven Java application that integrates exception handling, user-defined exceptions, string manipulation, and wrapper classes to solve a real-world problem with robust input validation. - Design Java programs to perform structured file processing, including text manipulation, data validation, buffering, and efficient file handling using appropriate stream classes.	
MULTITHREADING, I/O AND FILE HANDLING Process vs Thread – Thread Life Cycle and States – Thread Model – Synchronization concepts – I/O Stream Hierarchy – Byte Streams vs Character Streams – File Handling overview. Practical Component: - Develop Java programs to create threads using the Thread class and Runnable interface, demonstrating thread creation, execution, priorities, and life cycle states. - Design Java applications to demonstrate multithreading concepts, synchronization, and coordination of shared resources using synchronized methods and blocks. - Implement Java programs using byte streams and character streams to perform input and output operations on files and standard input/output devices. - Develop Java applications to create, read, write, append, and manage files using Java File I/O classes. - Design Java programs to perform file and directory operations such as creating, deleting, renaming, copying, and retrieving file properties using Java file handling classes	3 Hours 12 Hours
COLLECTIONS, GUI OVERVIEW AND DATABASE CONNECTIVITY Collection Framework Hierarchy – List, Set, Queue, Map interfaces overview – Generic Collections – Introduction to Lambda Expressions and Stream API – GUI Programming overview (Swing and JavaFX) – JDBC Architecture and Driver types. Practical Component: - Develop Java programs using the Collection Framework, including List, Set, Queue, Map, and generic collections, to perform data storage, retrieval, searching, sorting, and manipulation operations. - Design Java programs using lambda expressions and the Stream API to perform filtering, mapping, sorting, aggregation, and other functional operations on collections. - Design and develop interactive graphical user interfaces using JavaFX by creating layouts, controls, event handling mechanisms, and scene management for desktop applications. - Develop Java applications to establish database connectivity using JDBC, perform CRUD (Create, Read, Update, Delete) operations, and execute SQL queries using appropriate JDBC classes.	3 Hours 12 Hours

Theory Hours:	15	Tutorial Hours:	0	Practical Hours:	60	Project Hours:	0	Total Hours:	75
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Learning Resources*	
Textbooks	
1. Cay S. Horstmann, Core Java Volume I – Fundamentals, 13th Edition, Pearson, 2025. 2. Herbert Schildt, Java: The Complete Reference, 13th Edition, McGraw-Hill Education, 2024. 3. Kathy Sierra, Bert Bates, and Trisha Gee, Head First Java, 3rd Edition, O'Reilly Media, 2022.	
Reference books/ Web Links	
1. Paul Deitel and Harvey Deitel, Java How to Program, 11th Edition, Pearson, 2019. 2. E. Balagurusamy, Programming with Java: A Primer, 7th Edition, McGraw-Hill Education, 2024.	


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3. Barry Burd, Beginning Programming with Java For Dummies, 6th Edition, Wiley, 2021. 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 (Embedded course)

SA-II, MCQ, Assignments, Model-1, Model-2 and End Semester Examination (Lab)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert
	-	Ms. P. Anitha, AP/CSE Ms. G. Shobana, AP/IT
Recommended by BoS on	06.06.2026	
Academic Council Approval	No: 30	Date 19.06.2026



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24ADI016	FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	L	T	P	J	C
		3	0	2	0	4
PC		SDG		8,9		
Pre-requisite courses	NIL	Data Book / Codes / Standards (If any)			NA	

Course Objectives:		The purpose of taking this course is to:	
1	Understand the basic ideas of AI, intelligent agents, and logical reasoning.		
2	Learn how to solve problems using different search methods and simple game strategies.		
3	Use probability and basic models like Bayesian Networks and HMMs to reason under uncertainty.		
4	Understand how agents make decisions using utilities, decision networks, and MDPs.		
5	Learn simple machine learning and NLP methods for learning from data and processing text.		

Course Outcomes:		After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO1	Model intelligent agents and apply knowledge representation techniques, including predicate logic, to perform automated reasoning.		Ap
CO2	Analyze and implement informed and uninformed search algorithms to solve complex state-space search problems.		An
CO3	Apply probabilistic models, such as Bayesian Networks, to represent and infer knowledge under conditions of uncertainty.		Ap
CO4	Analyze sequential decision-making problems using Markov Decision Processes and game-theoretic models.		An
CO5	Demonstrate basic concepts of learning from examples and simple text processing techniques for communication in AI 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	Engineering Tool Usage	The Engineer	Ethics	Individual and Collaborati	Communication	Project Management and	Life-Long Learning	PSO-1	PSO-2
CO1	3	2				2	3		3	2			
CO2	3	3	3			2	3		3	3	3		
CO3	3	2			2	2	3	2	3	2			2
CO4	3	3			2	2	3		3	3			2
CO5	3	3	3		3	2	2	3	3	3	3		3


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Course Content	
INTRODUCTION TO AI AND LOGICAL REASONING AI: A Brief History. Intelligent Agents: Agents and Environments, Rationality, PEAS: Performance, Measure, Environment, Actuators, Sensors - Agent Types. Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic: Syntax, Semantics - Inference in First-Order Logic - Unification, Forward & Backward Chaining, Resolution.	10 Hours
Practical Component Implement a simple reflex agent for a defined environment - Develop a small knowledge base using First-Order Logic and perform queries using a logic programming tool.	6 Hours
PROBLEM-SOLVING THROUGH SEARCH Defining Problems as State-Space Search. Uninformed Search Strategies: Breadth-First Search (BFS), Depth-First Search (DFS), Uniform Cost Search. Informed (Heuristic) Search Strategies: Greedy Best-First Search, A* Search. Heuristic Functions. Adversarial Search and Games: Min-Max Algorithm, Alpha-Beta Pruning. Constraint Satisfaction Problems (CSP).	10 Hours
Practical Component Implement the A* search algorithm to solve a pathfinding problem - Develop an AI player for a simple game like Tic-Tac-Toe using the Min-Max algorithm with Alpha-Beta Pruning.	6 Hours
REASONING WITH UNCERTAINTY Quantifying Uncertainty: Probability, Conditional Probability, Bayes' Rule. Probabilistic Reasoning Systems: Representing knowledge in an uncertain domain using Bayesian Networks, Semantics of Bayesian Networks, Exact Inference in Bayesian Networks. Temporal Models: Hidden Markov Models (HMMs) for reasoning over time.	9 Hours
Practical Component Build a Bayesian Network for a simple diagnostic problem and calculate conditional probabilities. Implement a basic Hidden Markov Model for a sequence-based task, such as weather prediction.	6 Hours
DECISION MAKING Making Simple Decisions: Utility Theory, Utility Functions, Decision Networks. Making Complex Decisions: Markov Decision Processes (MDPs), The Bellman Equation, Value Iteration. Introduction to Game Theory: Modeling strategic interactions between rational agents.	9 Hours
Practical Component Implement the Value Iteration algorithm to find the optimal policy for a simple MDP - Model and solve a simple strategic game.	6 Hours
LEARNING AND COMMUNICATING Learning from Examples: Forms of Learning- Supervised Learning- Learning Decision Trees- Evaluating and Choosing the Best Hypothesis- Theory of Learning – Natural Language Processing: Language Models- Text Classification- Information Retrieval- Information Extraction.	7 Hours
Practical Component Implement a simple rule-based learning system to simulate learning from examples – Develop a basic text-processing and keyword-based communication model for information extraction.	6 Hours



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

Textbooks

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 4th Edition, Pearson Education / Prentice Hall of India, 2022.

Reference books/ Web Links

1. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", 6th Edition, Pearson Education, 2011.
2. Ethem Alpaydin, "Introduction to Machine Learning", 4th Edition, MIT Press, 2020.

Online Resources

1. Andrew Ng — "Machine Learning Specialization" on Coursera:
<https://www.coursera.org/specializations/machine-learning-introduction> Coursera
2. UC Berkeley — "CS 188: Introduction to Artificial Intelligence" Course Materials:
<https://inst.eecs.berkeley.edu/~cs188/>

Assessment (Embedded course)

SA I, SA II, Activity and Learning Task(s), 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)
		Preethi G AP/AI&DS
Recommended by BoS on	29.11.2025	
Academic Council Approval	No: 29	Date: 24.12.2025



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24ADI204	DATA SCIENCE AND VISUALIZATION	L	T	P	J	C
		2	0	0	2	3
PC		SDG	9, 13			
Pre-requisite courses	NIL	Data Book / Code book (If any)			NIL	

Course Objectives:

The purpose of taking this course is to:

1	Understand the fundamental concepts of data science and develop basic skills in data loading, inspection, and visualization using Python.
2	Learn descriptive statistical methods to summarize data, detect patterns, and identify outliers through visual and numerical techniques.
3	Apply data transformation techniques such as scaling, encoding, and discretization to prepare datasets for analysis.
4	Explore dimensionality reduction methods like PCA to select and extract meaningful features from high-dimensional data.
5	Develop the ability to create clear data stories and build complete data science pipelines that communicate insights effectively.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply foundational concepts of data science to visualize and introspect data.	Ap
CO2	Perform Exploratory Data Analysis by applying descriptive statistics and univariate/bivariate visualizations to uncover data distributions, patterns, and relationships, while analyzing data quality through the detection of outliers and exploration of missing value patterns.	An
CO3	Analyze data transformation techniques using Python libraries and their impact on feature distribution.	An
CO4	Apply dimensionality reduction techniques to optimize feature selection.	Ap
CO5	Recommend actionable insights integrating storytelling techniques and Assess dashboards for clarity, effectiveness, and representation.	E

Course Outcome	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)
	1	2	3	4	5	6	7	8	9	10	11	



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

Course Content

FOUNDATIONS OF DATA SCIENCE

Defining Data Science - The Data Science Process - Data Types and Attributes - Python Essentials: NumPy & Pandas - Data Loading and Inspection - Data Visualization Goals - Introduction to Matplotlib & Seaborn - Basic Plotting and Customization.

6 Hours

DESCRIPTIVE STATISTICS

Advanced Attribute Types - Measures of Central Tendency - Measures of Dispersion - Skewness and Kurtosis - Visual Outlier Identification - Missing Data Visualization - Exploratory Data Analysis (EDA) Techniques - Histograms, KDEs, Box Plots, and Violin Plots.

6 Hours

DATA TRANSFORMATION

Introduction to Data Transformation - Feature Scaling and Normalization - Standardization and Min-Max Scaling - Skewness Correction Transformations - Categorical Feature Encoding - One-Hot and Label Encoding - Binning and Discretization - Applying and Visualizing Transformations.

6 Hours

DIMENSIONALITY REDUCTION

Feature Selection and Extraction - Variance Thresholding - Correlation-Based Feature Selection - Mitigating Multicollinearity - Principal Component Analysis (PCA) Introduction - Applying and Visualizing PCA results.

6 Hours

DATA STORYTELLING

Introduction to Data Storytelling - Narrative Structuring - Choosing Effective Visuals - Visual Design Principles - Introduction to Dashboards - Interactive Plotting Concepts - Ethical Considerations in Visualization - Mini-Project: End-to-End EDA and Storytelling.

6 Hours

PROJECT

To design and develop a complete data science pipeline that processes real-world structured/unstructured datasets through data loading, descriptive statistics, transformation, dimensionality reduction, and insight-driven storytelling. The pipeline should integrate foundational data analysis techniques, advanced visualization, PCA-based feature extraction, and end-to-end EDA culminating in an interactive narrative or

30 Hours



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dashboard-level presentation.					
Final Deliverables (Presentation & Report) • GitHub repo with code, data samples, and README • 10-minute project presentation with visuals • Final report summarizing problem, methods, datasets, results, and future work					
Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 30	Total Hours:60	

Learning Resources					
Textbooks					
1. Python Data Science Handbook, Jake VanderPlas, O'Reilly Media, 2016. 2. Fundamentals of Data Visualization, Claus O. Wilke (O'Reilly, 2019). 3. Storytelling with Data: A Data Visualization Guide for Business Professionals, Cole Nussbaumer Knaflie,(Wiley 2019).					
Reference					
1. Python for Data Analysis, Wes McKinney (O'Reilly, 3rd Ed., 2022). Practical Statistics for Data Scientists,50+ Essential Concepts Using R and Python - Peter Bruce, Andrew Bruce, Peter Gedeck, O'Reilly, 2nd Ed., (2020). 2. Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, Aurélien Géron , O'Reilly, 3rd Ed., (2022). 3. Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Müller & Sarah Guido, O'Reilly, (2016).					
Online Resources (Weblinks)					
1. MITx (via edX): https://www.edx.org/course/introduction-to-computer-science-and-programming-using-python-2 2. MITx (via edX): https://www.edx.org/course/introduction-to-computational-thinking-and-data-science-2 3. MIT OCW: https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2014/ 4. MIT OCW: https://ocw.mit.edu/courses/6-036-introduction-to-machine-learning-fall-2020/ 5. IBM : Data Visualization with Python - https://www.edx.org/course/data-visualization-with-python 6. University of Michigan (via Coursera or edX): Applied Plotting, Charting & Data Representation in Python - https://www.coursera.org/learn/python-plotting 7. NPTEL: Data Analytics with Python (Jan 2024 offering example) - https://onlinecourses.nptel.ac.in/noc24_cs39/preview 8. NPTEL: Data Science for Engineers (Jan 2024 offering example) - https://onlinecourses.nptel.ac.in/noc24_cs111/preview 9. NPTEL: Statistical Methods For Data Science (Jan 2024 offering example) - https://onlinecourses.nptel.ac.in/noc24_ma77/preview					
Assessment (Embedded course)					
SA I, SA II, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce					


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Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution		Internal Expert(s)
-	-		Ms. Rupashini P R, AP/Department of Artificial Intelligence & Data Science
Recommended by BoS on	29.11.2025		
Academic Council Approval	No: 29	Date	24.12.2025


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IV SEMESTER

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)
CO1	Apply relational database concepts to define structures and manage data effectively.	Ap
CO2	Design and normalize relational database schemas using Entity-Relationship modelling and normalization techniques to ensure data integrity.	Ap
CO3	Implement relational operations and join strategies using relational algebra and SQL to retrieve and combine data efficiently.	Ap
CO4	Analyze transaction processing concepts, concurrency issues, and recovery techniques to ensure the consistency and correctness of database systems.	An
CO5	Apply CRUD operations in NoSQL databases to manage semi-structured and unstructured data effectively.	Ap

Course Outco	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)
	1	2	3	4	5	6	7	8	9	10	11	



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	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.

9 Hours

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.

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.

9 Hours

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.

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.

9 Hours

Practical Component

Simulation of relational Algebra operations – Performing joins using Relational Algebra – Implementation of various SQL joins.

6 Hours



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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.	9 Hours
Practical Component Implement multiple transactions using SQL involving BEGIN, COMMIT & ROLLBACK – Write SQL Queries for Nested Transactions.	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	9 Hours
Practical Component: Creation of Database and Performing CRUD operations in NoSQL – Querying with NoSQL databases.	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. 4 th Edition, McGraw Hill, 2015. 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)
SA-I, SA-II, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by


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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


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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
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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	


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Course Content	
DATA COMMUNICATIONS Basics of Data Communication, Network Models: The OSI Model, TCP/IP Protocol Suite, Addressing, Transmission Media, Networking Devices, Network Topologies.	8 Hours
Practical Component Demonstrate the use of network Diagnostic tools such as PING, TRACEROUTE, IPCONFIG, NSLOOKUP AND NETSTAT	6 Hours
DATA LINK LAYER Encoding, Error Detection, Reliable Transmission, MAC Protocols, Multiple Access Protocols: Random Access, Controlled Access and Channelization.	9 Hours
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.	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.	10 Hours
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
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.	9 Hours
Practical Component Implementation of substitution and transposition technique.	8 Hours

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

Learning Resources
Textbooks
1. Behrouz A. Forouzan, "Data Communications and Networking with TCP/IP 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).


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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)

SA-I, SA-II, Activity and Learning Task(s), 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 26.06.2025



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24CSI014	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	J	C
		3	0	2	0	4
PC		SDG		9		

Pre-requisite courses	24CSI104 Data Structures and Algorithms	Data Book / Codes / Standards (If any)	NIL
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Course Objectives:

The purpose of taking this course is to:

1	Understand fundamental algorithmic problem-solving techniques and the importance of algorithmic analysis in various problem types, data structures, and efficiency classes.
2	Explore advanced algorithmic paradigms like Divide and Conquer, Greedy Strategy, Dynamic Programming, Backtracking, Branch and Bound for solving complex problems.
3	Analyze the efficiency of algorithms using theoretical and empirical methods considering their time complexity and space complexity.
4	Investigate computational complexity theory, including P, NP, NP-complete, and NP-hard problems, and the use of approximation algorithms in optimization.

Course Outcomes:

After successful completion of this course, the students shall be able to		Bloom's Taxonomy Level (BTL)
CO1	Apply algorithmic problem-solving strategies and analyze the performance of recursive and non-recursive algorithms using asymptotic notations.	Ap
CO2	Apply divide and conquer techniques to solve computational problems and use recurrence solving methods to determine the efficiency of recursive algorithms.	Ap
CO3	Apply greedy and dynamic programming approaches to solve optimization problems and evaluate their efficiency.	Ap
CO4	Analyze combinatorial problems using backtracking and branch-and-bound strategies to derive optimal solutions.	An
CO5	Analyze problem complexity to classify problems as P, NP, NP-complete, or NP-hard and examine approximation techniques for solving hard problems.	An

Course Outcomes	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)
	1	2	3	4	5	6	7	8	9	10	11	



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	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 Teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2		2								3	
2	3	3	2	2								3	
3	3	3	2	2								3	
4	2	3		2								2	
5	2	2		2								2	

Course Content

FOUNDATIONS OF ALGORITHM ANALYSIS

Fundamentals of algorithmic problem solving – Important problem types – Analysis framework – Asymptotic notations and basic efficiency classes – Mathematical Analysis: Recursive algorithms, non-recursive algorithms - Brute Force String matching.

7 Hours

Practical Component

Implement and compare recursive vs. iterative algorithms - Analyze different algorithmic performance – Brute Force String matching.

4 Hours

DIVIDE AND CONQUER

Divide and conquer: Solving recurrences: Substitution method, recursion-tree method, master method. The maximum-subarray problem - Multiplication of large integers – Strassen's matrix multiplication.

10 Hours

Practical Component

Implement and analyze the maximum subarray problem using divide and conquer – Implement Strassen's matrix multiplication algorithm.

6 Hours

GREEDY STRATEGY AND DYNAMIC PROGRAMMING

Greedy algorithms: Fractional Knapsack Problem - Activity selection problem – Huffman codes. Elements of dynamic programming - Matrix chain multiplication - Longest Common Subsequence (LCS) - 0/1 Knapsack problem and memory functions – Optimal binary search trees - All Pairs Shortest Paths: Floyd-Warshall Algorithm.

12 Hours

Practical Component

Construct Huffman coding tree for data compression - Implement Matrix chain multiplication - Solve Longest Common Subsequence (LCS) Problem - Implement 0/1 knapsack problem using memory functions.

8 Hours

BACKTRACKING, BRANCH AND BOUND

Backtracking strategy: N-Queens Problem – Hamiltonian circuit problem – Subset Sum problem – Graph Coloring. Branch and bound strategy: Assignment problem - Traveling Salesperson Problem - 0/1 knapsack problem.

9 Hours



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Practical Component Apply backtracking to solve the N-Queens problem - Implement backtracking approach to perform Graph Coloring using minimum number of colors - Apply Branch and Bound technique to solve the Travelling Salesman Problem for optimal tour cost.	8 Hours
COMPUTATIONAL COMPLEXITY AND APPROXIMATION ALGORITHMS Polynomial time, Polynomial-time verification, P and NP problems, NP-Complete problems – NP-Hard problems – NP-completeness and reducibility - Introduction to Approximation Algorithms: vertex-cover problem – Randomization and linear programming: Subset-sum problem.	7 Hours
Practical Component Implement the Vertex-Cover Problem using a Greedy Approximation Algorithm.	4 Hours

Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	75
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Learning Resources
Textbooks
1. Cormen, Thomas H., Leiserson, Charles E., Rivest, Ronald L., Stein, Clifford., Introduction to Algorithms, MIT Press, Cambridge (2022). 2. Levitin, Anany., Introduction to the Design and Analysis of Algorithms, Pearson Education, New York (2021). 3. Horowitz, Ellis., Sahni, Sartaj., Fundamentals of Computer Algorithms, Galgotia Publications, New Delhi (2008).
Reference books/ Web Links
1. Sen, Sandeep., Kumar, Amit. Design and Analysis of Algorithms: A Contemporary Perspective. United States: Cambridge University Press, 2019. 2. Baase, Sara. Computer Algorithms: Introduction to design and analysis. India: Pearson Education, 2009. 3. Aho, Alfred V., Hopcroft, John E., The Design and Analysis of Computer Algorithms. India: Pearson Education, 1974. 4. Kozen, Dexter C. The design and analysis of algorithms. Springer Science & Business Media, 2012. 5. Kleinberg, Jon., Tardos, Éva., Algorithm Design, Pearson Education, New York (2022). 6. Dasgupta, Sanjoy., Papadimitriou, Christos H., Vazirani, Umesh., Algorithms, McGraw-Hill Education, New York (2006). 7. Horowitz, Ellis., Sahni, Sartaj., Rajasekaran, Sanguthevar., Computer Algorithms, Silicon Press, New Jersey (2007).
Online Resources
1. https://onlinecourses.nptel.ac.in/noc19_cs47/preview 2. https://onlinecourses.swayam2.ac.in/nou25_ma09/preview 3. https://onlinecourses.swayam2.ac.in/cec20_cs03/preview

Assessment (Embedded course)
SA I, SA II Activity and Learning Task(s), MCQ, End Semester Examination (ESE)


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Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution		Internal Expert
-	-		Ms. E. Shriaarthy, Department of Artificial Intelligence and Data Science
Recommended by BoS on	09.05.2025		
Academic Council Approval	No: 28	Date	26.06.2025



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24ADI003	MACHINE LEARNING	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
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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	


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	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 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.	7 Hours
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 Metrics-Bias Variance Tradeoff- Information Criteria-Based Model Selection- Overfitting – Underfitting – Gradient descent – Regularization – Assumptions in linear regression – Error analysis	8 Hours
Practical Component Implementation of multi variable regression problem- Optimization of regression model	8 Hours
CLASSIFICATION MODELS Logistic Regression-Naive Bayes Classifiers-Decision Tree-K-Nearest Neighbors-Support Vector Machine – Evaluation metrics – AUC ROC- Class Imbalance – SMOTE – Cross-Validation Techniques-Ensemble Learning-Bagging- Random Forests-Boosting - AdaBoost -Gradient Boosting	12 Hours
Practical Component Implementation of classification models- Evaluation of models using performance metrics.	6 Hours



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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)	10 Hours
Practical Component Implementation of clustering algorithms- Identification of patterns- Detection of outliers	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	8 hours
Practical Component Implementation of Collaborative Filtering-based Recommendations- Implementation of Matrix Factorization-based recommendations- Building a Recommendation system based on item features	6 Hours

Theory Hours:45	Tutorial Hours:0	Practical Hours: 30	Project Hours:0	Total Hours: 75
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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)
SA I, SA II, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce


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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


Signature of the BOS Chairman, AI&DS