



SASURIE
COLLEGE OF ENGINEERING
(Autonomous)

Vijayamangalam, Tiruppur - 638056



CURRICULUM AND SYLLABI

REGULATION 2026

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING



SASURIE COLLEGE OF ENGINEERING

(Autonomous Institution, Affiliated to Anna University, Chennai)



CURRICULUM & SYLLABI – 2026

CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION

(For the students admitted from the academic year 2026 - 2027)

MASTER OF ENGINEERING IN COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION AND MISSION OF THE INSTITUTE

OUR VISION

To become a leading professional institution by offering high-quality education, fostering successful graduates with strong employability prospects, advancing sustainable research through ethical practices and empowering young minds to contribute to the nation's growth in Engineering, Technology and Management.

OUR MISSION

- To deliver high-quality education that empowers students with the knowledge, skills and ethical values necessary for success in Engineering, Technology and Management.
- To develop graduates with strong employability potential, fostering innovation, leadership and a commitment to continuous learning.
- To advance sustainable research and development that addresses real-world challenges and drives societal progress.
- To inspire and shape young minds into responsible professionals dedicated to contributing to the nation's growth and development.

VISION AND MISSION OF THE DEPARTMENT

VISION

To emerge as a leader in Computer Science and Engineering education by imparting high-quality education fostering innovation, producing technically proficient graduates with excellent employability skills, advancing cutting-edge research, promoting ethical practices, and empowering young minds to develop sustainable solutions that drive technological progress and contribute to the nation's growth.

MISSION

- To provide quality education that equips students with strong technical knowledge, professional skills, ethical values, and a commitment to lifelong learning for successful careers in Engineering, Technology, and Management.
- To nurture innovation, leadership, and employability by fostering creativity, critical thinking, research, and entrepreneurship to address real-world challenges and promote sustainable development.
- To develop socially responsible professionals who contribute to the advancement of society and the nation's growth through integrity, excellence, and a strong sense of civic responsibility.

PROGRAM OUTCOMES (POs)

PO1: Demonstrate proficiency in the applied fields of Computer Science and Engineering.

PO2: Prepare, write, and present comprehensive technical reports and documentation effectively.

PO3: Independently undertake research, investigation, and development activities to solve practical problems.

PO4: Engage in self-learning and continuously update knowledge and skills in the field of Computer Science and Engineering.

PO5: Develop creative and innovative solutions to address real-life problems.

PO6: Demonstrate team-building, goal-setting, and leadership skills to foster successful entrepreneurial ventures.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To enable graduates to pursue higher studies and research, establish successful careers in academia and industries related to Computer Science and Engineering, or become successful entrepreneurs.

PEO2: To equip graduates with advanced knowledge, techniques, tools, and competencies to develop innovative, sustainable, and technology-driven solutions to real-world problems.

PEO3: To develop critical thinking, leadership, decision-making, communication, and professional skills, guided by ethical and societal values, enabling graduates to contribute responsibly to society and the nation.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Ability to apply mathematical and computing knowledge to propose viable ideas and develop solutions for solving real-world problems.

PSO2 : Ability to design and develop computer-based systems by applying engineering principles, software design processes, programming languages, and appropriate tools.

**M.E., – COMPUTER SCIENCE AND ENGINEERING
REGULATIONS 2026**

For the students admitted from 2026 onwards

**CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR I – IV SEMESTERS
SEMESTER I**

SL. NO.	COURSE CODE	COURSE TITLE	COURSE TYPE	CATEGORY	L	T	P	J	C
1	P26MA101	Advanced Mathematical Methods	T	BSC	3	1	0	0	4
2	P26CP111	Advanced Data Structures and Algorithms	TWL	PCC	2	0	2	0	3
3	P26CP101	Network Technologies	T	PCC	3	0	0	0	3
4	P26CP102	Agile Software Development and Usability Engineering	T	PCC	3	0	0	0	3
5	P26CP103	Artificial Intelligence and Machine Learning	T	PCC	3	0	0	0	3
6	P26CP104	Prompt Engineering	T	PCC	3	0	0	0	3
7	P26RM101	Research Methodology and IPR	T	HSMC	3	0	0	0	3
Total					20	1	2	0	22

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	COURSE TYPE	CATEGORY	L	T	P	J	C
1	P26CP201	Modern Operating Systems	T	PCC	3	0	0	0	3
2	P26CP202	Data science and Analytics	T	PCC	3	0	0	0	3
3	P26CP203	Deep learning Technique	T	PCC	3	0	0	0	3
4		Programme Elective - I	T	PEC	3	0	0	0	3
5		Programme Elective - II	T	PEC	3	0	0	0	3
6		Programme Elective - III	T	PEC	3	0	0	0	3
7	P26CP221	AI Tools Laboratory	P	PCC	0	0	4	0	2
Total					18	0	4	0	20

SEMESTER III

Sl. NO.	COURSE CODE	COURSE TITLE	COURSE TYPE	CATEGORY	L	T	P	J	C
1		Programme Elective - IV	T	PEC	3	0	0	0	3
2		Programme Elective - V	T	PEC	3	0	0	0	3
3		Programme Elective - VI	T	PEC	3	0	0	0	3
4	P26CP331	Project Work - I	P	EEC	0	0	12	0	6
Total					9	0	12	0	15
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
5		Industry Oriented Course	T	MCC	2	0	0	0	1

SEMESTER IV

Sl. NO.	COURSE CODE	COURSE TITLE	COURSE TYPE	CATEGORY	L	T	P	J	C
1	P26CP431	Project Work - II	P	EEC	0	0	24	0	12
Total					0	0	24	0	12

TOTAL CREDITS: 69

**PROGRAMME ELECTIVE
COURSES (PEC)**

Sl. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	J
1	P26CPP01	Information Retrieval Technique	PEC	3	0	0	3
2	P26CPP02	No SQL Database	PEC	3	0	0	3
3	P26CPP03	Software Defined Network	PEC	3	0	0	3
4	P26CPP04	Vehicular Systems	PEC	3	0	0	3
5	P26CPP05	Real time Systems	PEC	3	0	0	3
6	P26CPP06	Cyber Security Practices	PEC	3	0	0	3
7	P26CPP07	Reconfigurable Computing	PEC	3	0	0	3
8	P26CPP08	Digital Image processing and computer vision	PEC	3	0	0	3
9	P26CPP09	Social network analysis	PEC	3	0	0	3
10	P26CPP10	Data Visualization	PEC	3	0	0	3
11	P26CPP11	Applied natural language processing	PEC	3	0	0	3
12	P26CPP12	Bio Inspired Computing	PEC	3	0	0	3
13	P26CPP13	Game design	PEC	3	0	0	3
14	P26CPP14	Cloud Computing Technologies	PEC	3	0	0	3
15	P26CPP15	Block chain Technologies	PEC	3	0	0	3
16	P26CPP16	Mixed Reality	PEC	3	0	0	3
17	P26CPP17	Internet of Things	PEC	3	0	0	3
18	P26CPP18	Robotics	PEC	3	0	0	3
19	P26CPP19	Cognitive science	PEC	3	0	0	3

SYLLABUS:

UNIT I LINEAR ALGEBRA 12

Vector spaces – norms – Inner Products – Eigenvalues using QR transformations – QR factorization – generalized eigenvectors – Canonical forms – singular value decomposition and applications – pseudo inverse – least square approximations.

UNIT II PROBABILITY AND RANDOM VARIABLES 12

Probability – Axioms of probability – Conditional probability – Baye's theorem – Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.

UNIT III TWO-DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Functions of two-dimensional random variables – Regression curve – Correlation.

UNIT IV TESTING OF HYPOTHESIS 12

Sampling distributions – Type I and Type II errors – Small and Large samples – Tests based on Normal, Chi square and F distributions for testing of mean, variance and proportions – Tests for independence of attributes and goodness of fit.

UNIT V MULTIVARIATE ANALYSIS 12

Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components – Population principal components – Principal components from standardized variables.

Contact Periods:

Lecture: - 45 Periods Tutorial: 15 Periods Practical: - Total: 60 Periods

TEXT BOOKS:

1. Gilbert Strang, Introduction to Linear Algebra, 6th Edition, Wellesley–Cambridge Press, 2023.
2. Sheldon M. Ross, Introduction to Probability Models, 13th Edition, Academic Press, Elsevier, 2023.
3. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, Introduction to Mathematical Statistics, 8th Edition, Pearson, 2021.
4. Richard A. Johnson and Dean W. Wichern, Applied Multivariate Statistical Analysis, 6th Edition, Pearson, 2023.

REFERENCE BOOKS:

1. David C. Lay, Steven R. Lay and Judi J. McDonald, Linear Algebra and Its Applications, 6th Edition, Pearson, 2021.
2. Erwin Kreyszig, Herbert Kreyszig and Edward J. Norminton, Advanced Engineering Mathematics, 11th Edition, Wiley, 2023.
3. George Casella and Roger L. Berger, Statistical Inference, 2nd Edition, Cengage Learning, 2021.
4. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, 7th Edition, Wiley, 2021.

EVALUATION PATTERN:

Continuous Assessments			End Semester Examinations
CIAT 1	CIAT 2	Activities	
40%			60%
16(60)	16(60)	8(40)	60(100)

P26CP111	ADVANCED DATA STRUCTURES AND ALGORITHMS	CATEGORY: ESC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To explore advanced linear, tree, and graph data structures and their applications.
- To design efficient algorithms using appropriate algorithmic paradigms.
- To evaluate computational complexity and identify tractable vs. intractable problems.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Explain advanced linear, tree, and graph data structures and their real-world applications.	Understand
CO2	Design efficient algorithms using appropriate algorithmic paradigms such as divide and conquer, greedy, and dynamic programming.	Create
CO3	Analyze the time and space complexity of algorithms and distinguish between tractable and intractable problems.	Analyze
CO4	Apply suitable data structures and algorithms to solve complex computational problems effectively.	Apply
CO5	Evaluate and optimize algorithm performance for scalability and efficiency in practical applications.	Evaluate

CO PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	3	1	1	2	2	-	3	3
CO2	3	1	2	2	3	1	3	3
CO3	3	2	3	2	2	-	3	2
CO4	3	2	3	2	3	1	3	3
CO5	3	2	3	3	3	1	3	3
Correlation Levels; 1. Slight (low)			2. Moderate (Medium)			3. Substantial (High)		

SYLLABUS:**UNIT I LINEAR DATA STRUCTURES AND MEMORY OPTIMIZATION: 6**

Advanced arrays: Sparse arrays, dynamic arrays, cache-aware structures, Linked lists: Skip lists, unrolled linked lists, XOR linked lists, Stacks and Queues: Priority queues, double-ended queues, circular buffers, Hashing: Perfect hashing, cuckoo hashing, extendible hashing.

UNIT II ADVANCED TREE DATA STRUCTURES: 6

Balanced Trees: AVL, Red-Black Trees, Splay Trees, Treaps, Multi-way Trees: B-Trees, B+ Trees, R-Trees, Segment Trees, Fenwick Trees, Suffix Trees and Tries for string processing, Applications in indexing, text retrieval, computational geometry.

UNIT III GRAPH DATA STRUCTURES AND ALGORITHMS: 6

Representation: Adjacency list/matrix, incidence matrix, compressed storage, Traversals: DFS, BFS with applications, Shortest Path Algorithms: Dijkstra, Bellman-Ford, Floyd-Warshall, Johnson's algorithm, Minimum Spanning Trees: Prim's, Kruskal's, Borůvka's algorithm, Network Flow Algorithms: Ford-Fulkerson, Edmonds-Karp, Push-Relabel.

UNIT IV ALGORITHM DESIGN AND PARADIGMS: 6

Divide and Conquer: Karatsuba's multiplication, Strassen's algorithm, Greedy Methods: Huffman coding, interval scheduling, set cover approximation, Dynamic Programming: Matrix chain multiplication, Floyd-Warshall, knapsack variants, Backtracking and Branch-and-Bound, Randomized Algorithms and Probabilistic Analysis.

UNIT V COMPUTATIONAL COMPLEXITY AND APPROXIMATION ALGORITHMS: 6

Complexity Classes: P, NP, NP-Complete, NP-Hard, Reductions: Polynomial-time reductions, Cook-Levin theorem (overview), Approximation Algorithms: Vertex cover, set cover, TSP, k-center problem, Heuristic Algorithms: Local search, simulated annealing, genetic algorithms.

LIST OF EXPERIMENTS / EXERCISES:

1. Implement skip lists and measure performance compared with balanced BST.
2. Experiment with cache-aware data structures and analyze memory utilization.
3. Implement B+ tree for database indexing use-case.

4. Design a suffix tree-based algorithm for DNA sequence matching
5. Implement Johnson's algorithm for sparse graph shortest paths
6. Demonstration of Maximum flow in traffic or network routing simulation
7. Implement Strassen's algorithm and compare with naive matrix multiplication.
8. Develop a randomized algorithm for primality testing (Miller–Rabin).
9. Implement approximation algorithm for vertex cover.
10. Complexity analysis of a chosen NP-hard problem and implement a heuristic
11. Implement randomized and streaming algorithms on real-world datasets.
12. Design of parallel and distributed algorithms.

Contact Periods:

Lecture: 30 Periods

Tutorial: -

Practical: 30 Periods

Total: 60 Periods

TEXT BOOKS:

1. Gilbert Strang, Introduction to Linear Algebra, 6th Edition, Wellesley–Cambridge Press, 2023.
2. Sheldon M. Ross, Introduction to Probability Models, 13th Edition, Academic Press, Elsevier, 2023.
3. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, Introduction to Mathematical Statistics, 8th Edition, Pearson, 2021.
4. Richard A. Johnson and Dean W. Wichern, Applied Multivariate Statistical Analysis, 6th Edition Pearson, 2023.

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2. Erwin Kreyszig, Herbert Kreyszig and Edward J. Norminton, Advanced Engineering Mathematics, 11th Edition, Wiley, 2023.
3. George Casella and Roger L. Berger, Statistical Inference, 2nd Edition, Cengage Learning, 2021.
4. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, 7th Edition, Wiley, 2021.

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EVALUATION PATTERN:

Continuous Assessments					End Semester Examinations
Theory			Practical / Project		Theory
CIAT 1	CIAT 2	Activities	Evaluation of Student's work, Observation, Record, etc.	Lab Test	
35%			15%		50%
15(60)	15(60)	5(40)	10(75)	5(25)	50(100)

P26CP101	NETWORK TECHNOLOGIES	CATEGORY: PCC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the basic concepts of networks.
- To explore various technologies in the wireless domain.
- To study 4G and 5G cellular networks.
- To learn about Network Function Virtualization.
- To understand the paradigm of Software defined networks.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Explain basic networking concepts	Understand
CO2	Compare different wireless networking protocols	Understand
CO3	Describe the developments in each generation of mobile data networks	Analyze
CO4	Explain and develop SDN based applications	Apply
CO5	Explain the concepts of network function virtualization	Understand

CO PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	3	1	1	2	1	-	3	2
CO2	3	1	2	2	2	-	3	3
CO3	3	1	2	3	2	-	3	3
CO4	3	2	3	2	3	1	3	3
CO5	3	2	2	3	2	1	3	3
Correlation Levels; 1. Slight (low) 2. Moderate (Medium) 3. Substantial (High)								

SYLLABUS:

UNIT I NETWORKING CONCEPTS 9

Peer To Peer Vs Client-Server Networks. Network Devices. Network Terminology. Network Speeds. Network throughput, delay. Osi Model. Packets, Frames, And Headers. Collision And Broadcast Domains. LAN Vs WAN. Network Adapter. Hub. Switch. Router. Firewall, IP addressing.

UNIT II WIRELESS NETWORKS 9

Wireless access techniques- IEEE 802.11a, 802.11g, 802.11e, 802.11n/ac/ax/ay/ba/be, QoS – Bluetooth – Protocol Stack – Security – Profiles – Zigbee

UNIT III MOBILE DATA NETWORKS 9

4G Networks and Composite Radio Environment – Protocol Boosters – Hybrid 4G Wireless Networks Protocols – Green Wireless Networks – Physical Layer and Multiple Access – Channel Modelling for 4G – Concepts of 5G – channel access –air interface -Cognitive Radio-spectrum management – C-RAN architecture - Vehicular communications-protocol – Network slicing – MIMO, mmWave, Introduction to 6G.

UNIT IV SOFTWARE DEFINED NETWORKS 9

SDN Architecture. Characteristics of Software-Defined Networking. SDN- and NFV-Related Standards. SDN Data Plane. Data Plane Functions. Data Plane Protocols. OpenFlow Logical Network Device. Flow Table Structure. Flow Table Pipeline. The Use of Multiple Tables. Group Table. OpenFlow Protocol. SDN Control Plane Architecture. Control Plane Functions. Southbound Interface. Northbound Interface. Routing. ITU-T Model. Open Daylight. Open Daylight Architecture. OpenDaylight Helium. SDN Application Plane Architecture. Northbound Interface. Network Services Abstraction Layer. Network Applications. User Interface.

UNIT V NETWORK FUNCTIONS VIRTUALIZATION 9

Motivation-Virtual Machines –NFV benefits-requirements – architecture- NFV Infrastructure - Virtualized Network Functions - NFV Management and Orchestration- NFV Use Cases-NFV and SDN –Network virtualization – VLAN and VPN

Contact Periods:

Lecture: 45 Periods

Tutorial: -

Practical: -

Total: 45 Periods

TEXT BOOKS:

1. Andrew S. Tanenbaum, Nick Feamster and David J. Wetherall, Computer Networks, 6th Edition, Pearson, 2021.
2. William Stallings, Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud, 2nd Edition, Pearson, 2021.

REFERENCE BOOKS:

1. Saad Z. Asif, 5G Mobile and Wireless Communications Technology, Cambridge University Press, 2022.
2. Iwan Hoogendoorn, Getting Started with NSX-T: Logical Routing and Switching, Apress, 2021
3. Konstantinos Poularakis, Leandros Tassiulas and T. V. Lakshman, Modeling and Optimization in Software-Defined Networks, Springer, 2021.

EVALUATION PATTERN:

Continuous Assessments			End Semester Examinations
CIAT 1	CIAT 2	Activities	
40%			60%
16(60)	16(60)	8(40)	60(100)

P26CP102	AGILE SOFTWARE DEVELOPMENT AND USABILITY ENGINEERING	CATEGORY: PCC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand agile software development process, planning and management
- To use advanced software testing techniques
- To understand process of usability engineering

COURSE OUTCOMES:		BT Mapped (Highest Level)
On completion of the course, the students will be able to		
CO1	Elucidate agile software development and related methodologies	Understand
CO2	Develop user stories to manage and plan agile projects	Analyze
CO3	Make use of agile project transition and critical planning for a given software application.	Apply
CO4	Implement test driven development to increase quality.	Apply
CO5	Design an interface by applying usability guidelines and assessment methods beyond testing.	Apply

CO PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	3	1	1	2	1	1	1	1
CO2	3	2	3	2	2	3	3	3
CO3	3	2	3	2	3	3	3	3
CO4	3	2	3	2	3	1	3	3
CO5	3	3	3	3	3	1	3	3
Correlation Levels; 1. Slight (low) 2. Moderate (Medium) 3. Substantial (High)								

SYLLABUS:

UNIT I AGILE SOFTWARE DEVELOPMENT

9

Agile vs Traditional models - Agile manifesto - Agile methodologies - DSDM - FDD- Crystal - Scrum- Agile Modeling - Extreme Programming - Lean Software Development- Unified Process (UP).

UNIT II MANAGING AND PLANNING AGILE PROJECTS

9

Gathering software requirements - Eliciting requirements from users - Adopting Agile values writing user stories. Planning Agile Projects - Enhancement and replacement projects - Business process automation projects - Embedded and other real - time system projects.

UNIT III TRANSITIONING TO AGILE

9

Business Leadership Transition - Customer Relationship Transition, Project management Transition - Agile Transition in the public sector - Discussion for Critical Thinking.

UNIT IV TEST-DRIVEN DEVELOPMENT

9

Unit, integration, system and Acceptance testing - exploratory testing - automated and manual testing, exercising boundary conditions - driving development through constant testing. Usability engineering: Usability of interactive system - Development Processes - Interaction Styles and Design Issues.

UNIT V USABILITY ENGINEERING

9

Usability and other considerations - Generation of user interfaces - Usability Engineering life cycle - usability
Heuristic- Usability Testing- Usability Assessment methods beyond testing - Case Study on user
experience

Contact Periods:

Lecture: 45 Periods

Tutorial: -

Practical: -

Total: 45 Periods

TEXT BOOKS:

1. Roger S. Pressman and Bruce R. Maxim, *Software Engineering: A Practitioner's Approach*, 9th Edition, McGraw-Hill Education, 2020/2021.
2. Ian Sommerville, *Engineering Software Products: An Introduction to Modern Software Engineering*, Pearson, 2021.

REFERENCE BOOKS:

1. Mike Cohn, User Stories Applied: For Agile Software Development, Addison-Wesley Professional, 2021.
2. Alan Cooper, Robert Reimann, David Cronin and Christopher Noessel, About Face: The Essentials of Interaction Design, 4th Edition, Wiley, 2020/2021.
3. Jeffrey Rubin, Dana Chisnell and Jared Spool, Handbook of Usability Testing, 3rd Edition, Wiley, 2021.

EVALUATION PATTERN:

Continuous Assessments			End Semester Examinations
CIAT 1	CIAT 2	Activities	
40%			60%
16(60)	16(60)	8(40)	60(100)

PRE-REQUISITES:

- COURSE OBJECTIVES:**

- | COURSE OUTCOMES: | | BT Mapped
(Highest Level) |
|---|---|------------------------------|
| On completion of the course, the students will be able to | | |
| CO1 | Describe the fundamental concepts, scope, and applications of artificial intelligence and machine learning in solving real-world problems. | Understand |
| CO2 | Analyze various artificial intelligence and machine learning models to understand their behavior, performance, and suitability for different problem domains. | Analyze |
| CO3 | Evaluate machine learning algorithms and artificial intelligence techniques based on accuracy, efficiency, and applicability to specific use cases. | Apply |
| CO4 | Design intelligent systems by selecting and integrating appropriate machine learning models and AI techniques to address complex real- world applications. | Apply |

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	3	1	1	2	2	1	3	2
CO2	3	2	3	2	2	1	3	3
CO3	3	2	3	2	3	1	3	3
CO4	3	2	3	2	3	2	3	3
Correlation Levels; 1. Slight (low) 2. Moderate (Medium) 3. Substantial (High)								

SYLLABUS:

UNIT I PROBLEM SOLVING AND KNOWLEDGE REPRESENTATION 9

Solving problems by searching – adversarial search – constraint satisfaction problems – Logical agents – Propositional logic – First order logic – Forward chaining – Backward chaining – Ontological Representations and Reasoning Systems.

UNIT II UNCERTAIN KNOWLEDGE AND REASONING 9

Overview of uncertainty and basic probability – Baye’s rule – Bayesian networks – Hidden Markov models – Kalman filters – Utility Functions – Decision Networks – Sequential decision problems – Game theory.

UNIT III MACHINE LEARNING INTRODUCTION 9

Types of learning – Hypothesis space – Inductive bias – Evaluation – Cross validation – Bias variance – Bias Variance Trade off.

UNIT IV SUPERVISED LEARNING 9

Linear Regression – Logistic Regression - Decision trees: Classification and regression trees – Neural networks, multilayer perceptron – Support vector machines: linear and non-linear kernel functions – K nearest neighbours – Ensemble learning: bagging and boosting.

UNIT V UNSUPERVISED AND PROBABILISTIC LEARNING 9

Clustering: partition, hierarchical and density-based clustering – Self organizing maps – Expectation maximization – Gaussian mixture models – Principal component analysis – Bayesian learning: Bayes optimal classifier, Naïve Bayes classifier, Bayesian belief networks.

Contact Periods:

Lecture: 45 Periods

Tutorial: -

Practical: -

Total: 45 Periods

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, 2021.
2. Ethem Alpaydin, Introduction to Machine Learning, 4th Edition, MIT Press, 2020.

REFERENCE BOOKS:

1. Kevin P. Murphy, Probabilistic Machine Learning: An Introduction, MIT Press, 2022.
2. Christopher M. Bishop and Hugh Bishop, Deep Learning: Foundations and Concepts, Springer, 2024.
3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 3rd Edition, O'Reilly Media, 2022.

EVALUATION PATTERN:

Continuous Assessments			End Semester Examinations
CIAT 1	CIAT 2	Activities	
40%			60%
16(60)	16(60)	8(40)	60(100)

P26CP104	PROMPT ENGINEERING	CATEGORY: PCC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the fundamentals of Generative AI and Large Language Models (LLMs).
- To develop skills in designing effective prompts for various AI applications.
- To explore different prompt engineering techniques for improving model responses.

COURSE OUTCOMES:		BT Mapped
On completion of the course, the students will be able to		(Highest Level)
CO1	Explain the fundamentals of Generative AI and Large Language Models.	Understand
CO2	Design effective prompts using various prompting techniques.	Apply
CO3	Analyze and optimize prompts for improved AI performance.	Analyze
CO4	Apply prompt engineering in real-world applications such as coding, content generation, and automation.	Apply
CO5	Evaluate ethical, security, and bias issues in AI systems.	Evaluate

CO PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	3	-	2	2	1	-	2	1
CO2	3	1	2	2	3	-	3	3
CO3	3	2	3	3	3	-	3	3
CO4	3	3	3	2	3	2	3	3
CO5	2	2	3	3	2	1	2	2
Correlation Levels; 1. Slight (low) 2. Moderate (Medium) 3. Substantial (High)								

Artificial Intelligence overview – Generative AI concepts – Evolution of language models – Transformer architecture basics – Working of Large Language Models (LLMs) –Tokenization and embeddings – Applications of LLMs – Introduction to prompt engineering tools and platforms

Definition of prompts – Prompt structure and components – Types of prompting (Zero-shot, One-shot, Few-shot) – Instruction-based prompting – Role-based prompting – Output formatting – Prompt templates – Common prompt design errors and best practices.

Chain-of-Thought prompting – Step-by-step reasoning – Self-consistency techniques – Context window management – Prompt refinement and iteration – Prompt tuning concepts – Embeddings and vector databases (overview) – multi-modal prompting basics.

Code generation and debugging – Content generation and summarization – Data analysis using prompts – Chatbot and virtual assistant design – Prompting for research and education – Workflow automation using prompts – API-based prompt integration.

Bias and fairness in AI – Hallucination issues – Ethical considerations in prompt engineering – Prompt injection attacks – Data privacy and security – Evaluation metrics for prompt performance – Responsible AI practices – Future trends in prompt engineering.

Total: 45 Periods

TEXT BOOKS:

1. James Phoenix and Mike Taylor, Prompt Engineering for Generative AI: Future-Proof Inputs for Reliable AI Outputs, O'Reilly Media, 2024.
2. John Berryman and Albert Ziegler, Prompt Engineering for LLMs: The Art and Science of Building Large Language Model-Based Applications, O'Reilly Media, 2024.

REFERENCE BOOKS:

1. Jay Alamar and Maarten Grootendorst
2. , Hands-On Large Language Models: Language Understanding and Generation, O'Reilly Media, 2024.
3. Suhas Pai, Designing Large Language Model Applications: A Holistic Approach to LLMs, O'Reilly Media, 2025.
4. Vladimir Geroimenko, The Essential Guide to Prompt Engineering: Key Principles, Techniques, Challenges, and Security Risks, Springer, 2025.

EVALUATION PATTERN:

Continuous Assessments			End Semester Examinations
CIAT 1	CIAT 2	Activities	
40%			60%
16(60)	16(60)	8(40)	60(100)

P26RM101	RESEARCH METHODOLOGY AND IPR	CATEGORY: HSMC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the fundamental concepts and importance of research methodology in academic and industrial research.
- To develop the ability to identify research problems, formulate hypotheses, and design appropriate research methods.

COURSE OUTCOMES:		BT Mapped
On completion of the course, the students will be able to		(Highest Level)
CO1	Explain the principles, types, and processes of research methodology.	Understand
CO2	Identify research problems, formulate hypotheses, and design appropriate research strategies.	Apply
CO3	Analyze and interpret research data using suitable statistical and analytical tools	Analyze
CO4	Prepare technical reports, research papers, and present findings effectively.	Apply

CO PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	2	1	3	2	1	-	2	1
CO2	2	1	3	2	3	1	3	2
CO3	3	2	3	3	3	-	3	2
CO4	2	3	3	2	2	1	2	2
Correlation Levels; 1. Slight (low)			2. Moderate (Medium)			3. Substantial (High)		

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filing, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licenses, Licensing of related patents, patent agents, Registration of patent agents.

Lecture: 45 Periods **Tutorial: -** **Practical: -** **Total: 45 Periods**

1. C.R. Kothari and Gaurav Garg, Research Methodology: Methods and Techniques, 4th Edition, New Age International Publishers, 2021.
2. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 6th Edition, SAGE Publications, 2023.

REFERENCE BOOKS:

1. John W. Creswell and J. David Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 6th Edition, SAGE Publications, 2023.
2. Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, 5th Edition, Cengage Learning, 2022.
3. P. Narayanan, Intellectual Property Law, 4th Edition, Eastern Law House, 2021

EVALUATION PATTERN:

Continuous Assessments			End Semester Examinations
CIAT 1	CIAT 2	Activities	
40%			60%
16(60)	16(60)	8(40)	60(100)

MS	CATEGORY: PCC				
	L	T	P	J	C
	3	0	0	0	3

- distributed operating systems

	BT Mapped (Highest Level)
environment	Apply
en scenario in	Apply
strategy in	Understand
scenario	Apply
e environment	Apply

PO5	PO6	PSO1	PSO2
2	-	3	3
3	2	3	3
2	-	3	2
3	2	3	3
3	2	3	3
(Medium)		3. Substantial (High)	

SYLLABUS:

UNIT I DISTRIBUTED SYSTEMS

9

Introduction of Distributed Computing System - Distributed Computing System Models - Distributed Operating Systems - Issues and Trends in Distributed Operating Systems. Focus on resource sharing -Challenges. Case study: World Wide Web.

UNIT II SYNCHRONIZATION

9

Clock Synchronization - Event Ordering - Mutual Exclusion - Deadlock Modelling - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection and Recovery - Election Algorithms, Case study - Coda.

UNIT III DISTRIBUTED SHARED MEMORY

9

General Architecture - Structure of Shared Memory Space - Issues in design and implementation of Distributed Shared Memory - Consistency Models - Replacement Strategy - Thrashing. Case study: Enterprise Java Beans -from objects to components.

UNIT IV DISTRIBUTED FILE SYSTEMS

9

Distributed File Systems - File Models - File Accessing Models - File Sharing Semantics – File Caching Semantics - File Replication -Atomic Transactions - Case Study- LDAP.

UNIT V CLOUD AND MOBILE OS

9

Cloud OS - Introduction to Cloud Computing, Features of Cloud OS, Case Studies - Mobile OS - Introduction to Mobile Computing, Features of Mobile OS, Case Study -Face recognition app.

Contact Periods:

Lecture: 45 Periods

Tutorial: -

Practical: -

Total: 45 Periods

TEXT BOOKS:

1. Andrew S. Tanenbaum and Herbert Bos, Modern Operating Systems, 5th Edition, Pearson, 2022.
2. George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair, Distributed Systems: Concepts and Design, 5th Edition, Pearson, 2021.

REFERENCE BOOKS:

1. Thomas Erl and Eric Barceló Monroy, Cloud Computing: Concepts, Technology, Security, and Architecture, 2nd Edition, Pearson, 2023.
2. Raj Kamal, Mobile Computing, 3rd Edition, Oxford University Press, 2021.
3. V. V. Subrahmanyam, Advanced Topics in Operating Systems – Unit 3: Mobile Operating Systems, Indira Gandhi National Open University, 2021.

EVALUATION PATTERN:

Continuous Assessments			End Semester Examinations
CIAT 1	CIAT 2	Activities	
40%			60%
16(60)	16(60)	8(40)	60(100)

P26CP202	DATA SCIENCE AND ANALYTICS	CATEGORY: PCC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the techniques and processes of data science
- To apply descriptive data analytics
- To visualize data for various applications
- To understand inferential data analytics
- To analysis and build predictive models from data

COURSE OUTCOMES:		BT Mapped (Highest Level)
On completion of the course, the students will be able to		
CO1	Explain the data analytics pipeline	Understand
CO2	Describe and visualize data	Apply
CO3	Perform statistical inferences from data	Analyze
CO4	Analyze the variance in the data	Analyze
CO5	Build models for predictive analytics	Create

CO PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	3	1	2	2	2	-	3	2
CO2	3	2	2	2	3	-	3	3
CO3	3	2	3	2	3	-	3	2
CO4	3	2	3	2	3	-	3	2
CO5	3	2	3	2	3	1	3	3
Correlation Levels; 1. Slight (low) 2. Moderate (Medium) 3. Substantial (High)								

SYLLABUS:**UNIT I INTRODUCTION TO DATA SCIENCE****9**

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

UNIT II DESCRIPTIVE ANALYTICS**9**

Frequency distributions – Outliers –interpreting distributions – graphs – averages – describing variability – interquartile range – variability for qualitative and ranked data - Normal distributions – z scores –correlation – scatter plots – regression – regression line – least squares regression line – standard error of estimate interpretation of r^2 – multiple regression equations – regression toward the mean.

UNIT III INFERENCE STATISTICS**9**

Populations – samples – random sampling – Sampling distribution- standard error of the mean - Hypothesis testing – z-test – z-test procedure –decision rule – calculations – decisions – interpretations - one-tailed and two-tailed tests – Estimation – point estimate – confidence interval– level of confidence – effect of sample size

UNIT IV ANALYSIS OF VARIANCE**9**

t-test for one sample – sampling distribution of t – t-test procedure – t-test for two independent samples – p-value – statistical significance – t-test for two related samples. F-test – ANOVA –Two factor experiments – three f-tests – two-factor ANOVA –Introduction to chi-square tests.

UNIT V PREDICTIVE ANALYTICS**9**

Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling. Regression using Stats Models – multiple regression – nonlinear relationships – logistic regression – estimating parameters – Time series analysis – moving averages – missing values – serial correlation – autocorrelation. Introduction to survival analysis.

Contact Periods:**Lecture: 45 Periods****Tutorial: -****Practical: -****Total: 45 Periods****TEXT BOOKS:**

1. John D. Kelleher and Brendan Tierney, Data Science, MIT Press, 2021.
2. David C. Diez, Christopher D. Barr and Mine Çetinkaya-Rundel, OpenIntro Statistics, 4th Edition, OpenIntro, 2022.

REFERENCE BOOKS:

1. Wes McKinney, Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter, 3rd Edition, O'Reilly Media, 2022.
2. Peter Bruce, Andrew Bruce and Peter Gedeck, Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python, 2nd Edition, O'Reilly Media, 2020.
3. James G. Shanahan and H. James Boehm, Applied Predictive Analytics, 2021.

EVALUATION PATTERN:

Continuous Assessments			End Semester Examinations
CIAT 1	CIAT 2	Activities	
40%			60%
16(60)	16(60)	8(40)	60(100)

P26CP203	DEEP LEARNING TECHNIQUES	CATEGORY: PCC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- Understand fundamentals of deep learning and basic models like linear regression, softmax, and MLP.
- Learn and apply convolutional neural networks for image processing tasks.
- Explore attention mechanisms and transformer architectures.
- Study recommender systems and generative models.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Apply the concepts of regression and multilayer perceptron to solve simple problems	Apply
CO2	exemplify the concepts of CNN models and apply it for solving computer vision related problems	Apply
CO3	Apply the concepts of RNN models for NLP and time series prediction.	Apply
CO4	Make use of TensorFlow/Keras frameworks to build attention-based models	Apply
CO5	Utilize deep learning methods for recommender systems and GANs in real-world problems.	Apply

CO PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	3	1	2	2	2	-	3	3
CO2	3	1	2	2	3	-	3	3
CO3	3	1	2	3	3	-	3	3
CO4	3	2	3	3	3	-	3	3
CO5	3	2	3	3	3	1	3	3
Correlation Levels; 1. Slight (low)			2. Moderate (Medium)			3. Substantial (High)		

SYLLABUS:**UNIT I FOUNDATIONS OF DEEP LEARNING****9**

Linear Regression: Linear Regression – LR Implementation from Scratch – Implementation of LR – Soft max Regression – The image Classification dataset – Implementation of Soft max Regression from Scratch - Concise Implementation of Soft max Regression. Multilayer Perceptrons: MLP-Implementation of MLP from Scratch - Concise Implementation of MLP - Model Selection, Under fitting, and Overfitting - Weight Decay – Dropout - Forward & Backward Propagation, and Computational Graphs - Numerical Stability and Initialization.

UNIT II CONVOLUTIONAL NEURAL NETWORKS**9**

Convolutional Neural Networks: Fully-Connected Layers to Convolutions - Convolutions for Images - Padding and Stride - Multiple Input and Multiple Output Channels – Pooling. Modern Convolutional Neural Networks: LeNet – AlexNet – VGG – NiN – Google LeNet - Batch Normalization – ResNet – DenseNet

UNIT III RECURRENT NEURAL NETWORKS**9**

Recurrent Neural Networks: Sequence Models - Text Preprocessing - Language Models and the Dataset – RNN – Implementation of RNN from Scratch - Concise Implementation of RNN - Backpropagation Through Time. Modern Recurrent Neural Networks: GRU – LSTM – Deep RNN – Bi-RNN - Machine Translation and the Dataset - Encoder-Decoder Architecture - Sequence to Sequence Learning - Beam Search

UNIT IV ATTENTION MECHANISMS AND TRANSFORMERS**9**

Attention Cues - Attention Pooling - Attention Scoring Functions - Bahdanau Attention - Multi-Head Attention - Self-Attention and Positional Encoding - The Transformer Architecture -Transformers for Vision - Large-Scale Pre training with Transformers.

UNIT V RECOMMENDER SYSTEMS AND GENERATIVE ADVERSARIAL NETWORKS**9**

Recommender Systems: Overview of Recommender Systems - The Movie Lens Dataset - Matrix Factorization – Auto Rec: Rating Prediction with Auto encoders - Personalized Ranking for Recommender Systems - Neural Collaborative Filtering for Personalized Ranking - Sequence-Aware Recommender Systems - Feature-Rich Recommender Systems - Factorization Machines - Deep Factorization Machines. Generative Adversarial Networks: GAN - Deep Convolutional Generative Adversarial Networks

Contact Periods:**Lecture: 45 Periods****Tutorial: -****Practical: -****Total: 45 Periods**

TEXT BOOKS:

1. Aston Zhang, Zachary C. Lipton, Mu Li and Alexander J. Smola, Dive into Deep Learning, Cambridge University Press, 2023.
2. François Chollet, Deep Learning with Python, 2nd Edition, Manning Publications, 2021.

REFERENCE BOOKS:

1. Ian Good fellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2021.
2. Christopher M. Bishop and Hugh Bishop, Deep Learning: Foundations and Concepts, Springer, 2024.
3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow, 3rd Edition, O'Reilly Media, 2022.

EVALUATION PATTERN:

Continuous Assessments			End Semester Examinations
CIAT 1	CIAT 2	Activities	
40%			60%
16(60)	16(60)	8(40)	60(100)

P26CP221	AI TOOLS LABORATORY	CATEGORY: PCC				
		L	T	P	J	C
		0	0	4	0	2

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To familiarize students with modern AI tools and platforms for real-time problem solving.
- To develop practical skills in using Generative AI tools for coding, content creation, and data analysis.
- To explore prompt engineering techniques through hands-on experiments

COURSE OUTCOMES:		BT Mapped (Highest Level)
On completion of the course, the students will be able to		
CO1	Understand and use various AI tools for real-time applications.	Understand
CO2	Apply prompt engineering techniques to generate accurate and efficient outputs.	Apply
CO3	Analyze AI-generated results for correctness, bias, and optimization.	Analyze
CO4	Develop solutions using AI tools for coding, data analysis, and automation.	Apply
CO5	Evaluate ethical and security challenges in AI tool usage.	Evaluate

CO PO MAPPING:

[illegible]

SYLLABUS:**LIST OF EXPERIMENTS / EXERCISES:**

1. Introduction to AI tools and platforms
2. Basic prompt engineering using zero-shot and few-shot techniques
3. Advanced prompting methods including chain-of-thought and role-based prompting
4. Code generation and debugging using AI tools
5. Content generation including report writing and summarization
6. Data analysis and interpretation using AI tools
7. Image generation and editing using AI prompts
8. Chatbot design and conversational AI development
9. Automation of tasks using AI tools
10. AI applications in research and documentation
11. Ethical issues, bias, and security in AI systems
12. Mini project using AI tools for real-time applications

Contact Periods:**Lecture: -****Tutorial: -****Practical: 60 Periods****Total: 60 Periods****EVALUATION PATTERN:**

Continuous Internal Assessments		End Semester Examinations (practical)	
		Test/Report Evaluation	Presentation & Viva
Practical			
Evaluation of students work, Observation, Record, etc.	Lab test (model practical)		
45(100)	15(100)	30(80)	10(20)
60		40	
Total		100	

