DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING

Scheme of Instructions, Examinations & Syllabi

(Autonomous BE Curriculum with effect from the Academic Year:2025-2026)

for

III & IV Semester of

Four Year Degree Programme for

Bachelor of Engineering (B.E)

in

Computer Science and Engineering

M24 CURRICULUM

Methodist College of Engineering & Technology

Affiliated by Osmania University Hyderabad, approved by AICTE, New Delhi,

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION

To become a leader in providing Computer Science and Engineering education with emphasis on knowledge and innovation.

MISSION

M1: To offer flexible programs of study with collaborations to suit industry needs.

M2: To provide quality education and training through novel pedagogical practices.

M3: To expedite high performance of excellence in teaching, research and innovations.

M4: To impart moral, ethical values and education with social responsibility.

PROGRAMME EDUCATIONAL OBJECTIVES

Graduates of Compute Science and Engineering at Methodist College of Engineering and Technology will be able to:

PEO1: Apply technical concepts, Analyze, Synthesize data to Design and create novel products and solutions for the real life problems.

PEO2: Apply the knowledge of Computer Science Engineering to pursue higher education with due consideration to environment and society.

PEO3: Promote collaborative learning and spirit of team. work through multidisciplinary projects

PEO4: Engage in life-long learning and develop entrepreneurial skills.

PROGRAMME SPECIFIC OUTCOMES

At the end of 4 years, Compute Science and Engineering graduates at MCET will be able to:

PSO1: Apply the knowledge of Computer Science and Engineering in various domains like networking and data mining to manage projects in multidisciplinary environments.

PSO2: Develop software applications with open-ended programming environments.

PSO3: Design and develop solutions by following standard software engineering principles and implement by using suitable programming languages and platforms.

Scheme of Instruction & Examination
B. E. - Computer Science and Engineering

CSE Semester - I									
S. No	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			Hours Per week			Contact Hours / week	Maximum Marks		
			L	T	P/D		CIE	SEE	
Theory Courses									
1	M24BS02HS	Engineering Mathematics –I	3	1	0	4	40	60	4
2	M24BS04HS	Engineering Physics	3	1	0	4	40	60	4
3	M24ES05CS	Programming for Problem Solving	3	0	0	3	40	60	3
4	M24ES02EE	Fundamentals of Electrical and Electronics Engineering	3	0	0	3	40	60	3
5	M24MC03CE	Environmental Science	2	0	0	2	40	60	0
Practical / Laboratory Courses									
6	M24BS52HS	Engineering Physics Lab	0	0	3	3	40	60	1.5
7	M24ES54CS	Programming for Problem Solving Lab	0	0	2	2	40	60	1
8	M24ES52EE	Fundamentals Of Electrical And Electronics Engineering Lab	0	0	2	2	40	60	1
9	M24ES53CE	Engineering Graphics Lab	1	0	4	5	40	60	3
		Total	**15**	**2**	**11**	**28**	**360**	**540**	**20.5**

Semester - II									
S. No	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			Hours Per week			Contact Hours / week	Maximum Marks		
			L	T	P/D		CIE	SEE	
Theory Courses									
1	M24BS03HS	Engineering Mathematics -II	3	1	0	4	40	60	4
2	M24BS01HS	Chemistry	3	1	0	4	40	60	4
3	M24HS01HS	English	2	0	0	2	40	60	2
4	M24ES01CS	Data Structures	3	0	0	3	40	60	3
Practical / Laboratory Courses									
5	M24BS51HS	Chemistry Lab	0	0	3	3	40	60	1.5
6	M24HS51HS	English Lab	0	0	2	2	40	60	1
7	M24ES51CS	Data Structures lab	0	0	2	2	40	60	1
8	M24ES56ME	Engineering Workshop Practice	0	0	4	4	40	60	2
9	M24MC04HS	Yoga/NSS/Sports	0	0	2	2	50	-	0
		Total	**11**	**2**	**13**	**26**	**370**	**480**	**18.5**

Scheme of Instruction & Examination
B. E. - Computer Science and Engineering

CSE Semester - III									
S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
Theory Courses									
1	M24BS308HS	Probability and Statistics	3	1	0	4	40	60	4
2	M24ES308EC	Logic Design and Computer Architecture	3	1	0	4	40	60	4
3	M24PC301CS	Design and Analysis of Algorithms	3	0	0	3	40	60	3
4	M24PC302CS	Software Engineering	3	0	0	3	40	60	3
5	M24PC303CS	Database Management Systems	3	0	0	3	40	60	3
6	M24MC302HS	Essence of Indian Traditional Knowledge	2	0	0	2	40	60	1
Practical / Laboratory Courses									
7	M24PC351CS	Database Management Systems Lab	0	0	2	2	40	60	1
8	M24PC352CS	Java Programming Lab	0	0	2*2	4	40	60	2
9	M24SE351CS	Skill Enhancement Course - IOT	0	0	2	2	40	60	1
		Total	**17**	**2**	**8**	**27**	**360**	**540**	**22**

****Bridge Courses being offered to Lateral Entry admitted students****

S. No	Semester	Subject Code	Subject Name	Credits
1	III	M24BR351HS	English Lab	0
2	III	M24BR352CS	PPS Lab (Programming for Problem Solving Lab)	0

CSE Semester - IV									
S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
Theory Courses									
1	M24PC404CS	Discrete Structures	3	0	0	3	40	60	3
2	M24PC405CS	Data Mining and Data Analytics	3	0	0	3	40	60	3
3	M24PC406CS	Operating Systems	3	0	0	3	40	60	3
4	M24PC407CS	Computer Networks	3	0	0	3	40	60	3
5	M24HS402HS	Human Values & Professional Ethics	2	0	0	2	40	60	2
6	M24PC408CS	MOOCS	0	0	0	0	0	0	3
Practical / Laboratory Courses									
7	M24PC453CS	Operating Systems Lab	0	0	2	2	40	60	1
8	M24PC454CS	Computer Networks Lab	0	0	2	2	40	60	1
9	M24PC455CS	Python Programming Lab	0	0	2*2	4	40	60	2
10	M24SE452CS	Skill Enhancement Course – CISCO CCNA Module I	0	0	2	2	40	60	1
		Total	**14**	**0**	**10**	**24**	**360**	**540**	**22**

****Bridge Courses being offered to Lateral Entry admitted students****

S. No	Semester	Subject Code	Subject Name	Credits
1	IV	M24BR401CE	Environmental Science	0
2	IV	M24BR451HS	Sports / Yoga / NSS	0

NOTE: In accordance with the National Credit Framework (NCrF), which defines 1 credit as equivalent to 30 hours of learning, the conventional L: T: P (Lecture: Tutorial: Practical) distribution has been mapped to Notional Hours, as reflected in the table below.

Scheme of Instruction & Examination
B. E. - Computer Science and Engineering

CSE Semester - III										
S. No.	Course Code	Course Title	Scheme of Instruction					Scheme of Examination		Credits
			Notional Hours					Maximum Marks		
			L	T	P/PW	TW/SL	Total Notional Hours	CIE	SEE	
Theory Courses										
1	M24BS308HS	Probability and Statistics	60	15	0	45	120	40	60	4
2	M24ES308EC	Logic Design and Computer Architecture	60	15	0	45	120	40	60	4
3	M24PC301CS	Design and Analysis of Algorithms	45	15	0	30	90	40	60	3
4	M24PC302CS	Software Engineering	45	15	0	30	90	40	60	3
5	M24PC303CS	Database Management Systems	45	15	0	30	90	40	60	3
6	M24MC302HS	Essence of Indian Traditional Knowledge	15	0	0	15	30	40	60	1
Practical / Laboratory Courses										
7	M24PC351CS	Database Management Systems Lab	0	0	30	0	30	40	60	1
8	M24PC352CS	Java Programming Lab	0	0	60	0	60	40	60	2
9	M24SE351CS	Skill Enhancement Course - IOT	0	0	30	0	30	40	60	1
		Total	**270**	**75**	**120**	**195**	**660**	**360**	**540**	**22**

****Bridge Courses being offered to Lateral Entry admitted students****

S. No	Semester	Subject Code	Subject Name	Credits
1	III	M24BR351HS	English Lab	0
2	III	M24BR352CS	PPS Lab (Programming for Problem Solving Lab)	0

CSE Semester - IV										
S. No.	Course Code	Course Title	Scheme of Instruction					Scheme of Examination		Credits
			Notional Hours					Maximum Marks		
			L	T	P/PW	TW/SL	Total Notional Hours	CIE	SEE	
Theory Courses										
1	M24PC404CS	Discrete Structures	45	15	0	30	90	40	60	3
2	M24PC405CS	Data Mining and Data Analytics	45	15	0	30	90	40	60	3
3	M24PC406CS	Operating Systems	45	15	0	30	90	40	60	3
4	M24PC407CS	Computer Networks	45	15	0	30	90	40	60	3
5	M24HS402HS	Human Values & Professional Ethics	30	0	0	30	60	40	60	2
6	M24PC408CS	MOOCS	0	0	0	90	0	0	0	3
Practical / Laboratory Courses										
7	M24PC453CS	Operating Systems Lab	0	0	30	0	30	40	60	1
8	M24PC454CS	Computer Networks Lab	0	0	30	0	30	40	60	1
9	M24PC455CS	Python Programming Lab	0	0	60	0	60	40	60	2
10	M24SE452CS	Skill Enhancement Course – CISCO CCNA Module I	0	0	30	0	30	40	60	1
		Total	**210**	**60**	**150**	**240**	**570**	**360**	**540**	**22**

****Bridge Courses being offered to Lateral Entry admitted students****

S. No	Semester	Subject Code	Subject Name	Credits
1	IV	M24BR401CE	Environmental Science	0
2	IV	M24BR451HS	Sports / Yoga / NSS	0

III SEMESTER SYLLABUS

Scheme of Instruction & Examination
B. E. - Computer Science and Engineering

CSE Semester - III									
S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
Theory Courses									
1	M24BS308HS	Probability and Statistics	3	1	0	4	40	60	4
2	M24ES308EC	Logic Design and Computer Architecture	3	1	0	4	40	60	4
3	M24PC301CS	Design and Analysis of Algorithms	3	0	0	3	40	60	3
4	M24PC302CS	Software Engineering	3	0	0	3	40	60	3
5	M24PC303CS	Database Management Systems	3	0	0	3	40	60	3
6	M24MC302HS	Essence of Indian Traditional Knowledge	2	0	0	2	40	60	1
Practical / Laboratory Courses									
7	M24PC351CS	Database Management Systems Lab	0	0	2	2	40	60	1
8	M24PC352CS	Java Programming Lab	0	0	2*2	4	40	60	2
9	M24SE351CS	Skill Enhancement Course - IOT	0	0	2	2	40	60	1
		Total	**17**	**2**	**8**	**27**	**360**	**540**	**22**

Bridge Courses being offered to Lateral Entry admitted students

S. No	Semester	Subject Code	Subject Name	Credits
1	III	M24BR351HS	English Lab	0
2	III	M24BR352CS	PPS Lab (Programming for Problem Solving Lab)	0

NOTE: In accordance with the National Credit Framework (NCrF), which defines 1 credit as equivalent to 30 hours of learning, the conventional L: T: P (Lecture: Tutorial: Practical) distribution has been mapped to Notional Hours, as reflected in the table below.

CSE Semester - III										
S. No.	Course Code	Course Title	Scheme of Instruction					Scheme of Examination		Credits
			Notional Hours					Maximum Marks		
			L	T	P/PW	TW/SL	Total Notional Hours	CIE	SEE	
Theory Courses										
1	M24BS308HS	Probability and Statistics	60	15	0	45	120	40	60	4
2	M24ES308EC	Logic Design and Computer Architecture	60	15	0	45	120	40	60	4
3	M24PC301CS	Design and Analysis of Algorithms	45	15	0	30	90	40	60	3
4	M24PC302CS	Software Engineering	45	15	0	30	90	40	60	3
5	M24PC303CS	Database Management Systems	45	15	0	30	90	40	60	3
6	M24MC302HS	Essence of Indian Traditional Knowledge	15	0	0	15	30	40	60	1
Practical / Laboratory Courses										
7	M24PC351CS	Database Management Systems Lab	0	0	30	0	30	40	60	1
8	M24PC352CS	Java Programming Lab	0	0	60	0	60	40	60	2
9	M24SE351CS	Skill Enhancement Course - IOT	0	0	30	0	30	40	60	1
		Total	**270**	**75**	**120**	**195**	**660**	**360**	**540**	**22**

Course Code	Course Title						Core / Elective
M24BS308HS	PROBABILITY & STATISTICS						BS
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Basic Differentiation, Integration results	60	15	0	45	40	60	4

Course Objectives:

The objective of the course is to make the students to:

1. Study the concepts of Probability and random variables
2. Provide the knowledge of discrete probability Distributions
3. Learn theoretical continuous probability distributions.
4. Provide the knowledge of correlation and regression.
5. Learn the concept of small sample tests and curve fitting

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Explain** the concepts of probability and random variables

CO2. **Apply** various probability distributions to solve practical problems, estimate unknown parameters of populations

CO3. **Find** statistical parameters of continuous probability distributions

CO4. **Perform** a regression analysis and to compute and **interpret** the coefficient of correlation

CO5. **Apply** t-test, F-test and Chi-Square test. Fitting of straight line, parabola and exponential curves.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3							2	2					
CO2	3			2				2	2					
CO3	3	2						2	2					
CO4	3			3				2	2					
CO5	3			3				2	2					

UNIT - I

Introduction of Probability, Conditional probability, Theorem of Total probability, Bayes' Theorem and its applications, Random variables, Types of random variables, Probability mass function and Probability density function, Expectations.

UNIT - II

Discrete probability distributions: Binomial and Poisson distributions, Mean, variance, moment generating function and evaluation of statistical parameters for these distributions, Moments, skewness and Kurtosis.

UNIT - III

Continuous probability distributions, Uniform, Exponential, Normal and Chi-square distributions, Mean variance, moment generating function and evaluation of statistical parameters for these distributions

UNIT - IV

Correlation, regression and Rank correlation. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

UNIT - V

t-Test for single mean, difference of means, f-test for ratio of variances, Chi-square test for goodness of fit and independence of attributes. Curve fitting by the method of least squares, fitting of straight lines, second degree parabolas and more general curves.

Text Books:

1. S. C. Gupta and V. K. Kapoor, *Fundamentals of Mathematical Statistics*. S. Chand Publishing.
2. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, 5th ed. Narosa Publications.
3. P. S. Krishna Das and C. Vijaya Kumar, *Engineering Mathematics*. Pearson India Education Services Pvt. Ltd., 2017.

Reference Books:

1. B. S. Grewal, Higher Engineering Mathematics, 43rd ed. Khanna Publications, 2014.
2. P. G. Hoel, S. C. Port, and C. J. Stone, Introduction to Probability Theory. Universal Book Stall, 2003.
3. E. Kreyszig, Advanced Engineering Mathematics, 9th ed. John Wiley, 2012.
4. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24ES308EC	LOGIC DESIGN AND COMPUTER ARCHITECTURE						ES
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	60	15	0	45	40	60	4

Course Objectives:

The objective of the course is to make the students to:

1. Understand basic number systems, logical gates, Boolean algebra & k map to minimize Boolean expressions.
2. Understand design of combinational and sequential circuits
3. Learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design.
4. Be familiarized with the hardware components and concepts related to memory organization.
5. Be familiarized with the hardware components and instruction set related to 8086 microprocessors

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Explain** binary number systems, Boolean algebra principles, computer organization components, memory hierarchies, and parallel processing architectures.

CO2. **Apply** Boolean algebra and K-map techniques to simplify logic expressions and design basic combinational circuits.

CO3. **Demonstrate** instruction execution cycles with addressing modes and analyze CPU register operations in 8086 architectures.

CO4. **Compare** memory technologies and I/O transfer modes with their performance characteristics.

CO5. **Analyze** pipelining challenges in processor architectures and evaluate multiprocessor organization trade-offs.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3- High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3									3	3		3
CO2	3	3	3		3							3	3	3
CO3	3	3	3									3	3	3
CO4	3	3										3	3	3
CO5	3	3		3							3	3	3	3

UNIT - I

Binary Systems, Boolean algebra and Logic Gates: Number Base Conversions- Binary, Decimal, Octal and Hexadecimal, Complements – 1's Complement, 2's Complement. Digital Logic gates, Boolean algebra, Boolean Functions, Canonical and Standard Forms

Gate Level Minimization: The K Map Method, Four-Variable Map, Product of Sums Simplification. Don't-Care Conditions

UNIT - II

Combinational Logic Design: NAND and NOR Implementation, Exclusive-OR Function, Design Procedure for Binary Adder, Subtractor, Decoders, Encoders, Multiplexer,

Demultiplexer
Sequential Logic Design: Flip-Flops – SR, D, JK, T Flipflops.

UNIT - lII
Basic Computer Organization: Functions of CPU, I/O Units, Memory Unit, Instruction Cycle
Central Processing Unit Organizations: General Register Organization, Stack Organization Instruction Formats- One address, two addresses, zero addresses and three addresses, addressing modes with numeric examples.

UNIT - lV
Input-Output Organizations Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Direct Memory Access (DMA), Input-Output Processor (lOP), Intel 8089 lOP
Memory Organizations: Memory hierarchy, Main Memory, Associative Memory, Cache Memory, Miss and Hit ratio, Virtual memory

UNIT - V
8086 Architecture: General purpose registers, Segment register, 8086 Flag register, Address Generation
Parallel Processing: Pipelining - Arithmetic Pipeline, Instruction Pipeline
Multiple Processor Organizations - Types of Parallel Processor Systems, Parallel Organizations, Symmetric Multiprocessors - Organization, Multiprocessor Operating System Design Considerations, A Mainframe SMP, Multicore Organization

Text Books:
1. M. M. Mano, *Digital Design*, 4th ed. Pearson Education, Inc., 2002.
2. M. M. Mano, *Computer System Architecture*, 3rd ed. Prentice-Hall, Inc., 1993.
3. K. M. Bhurchandi, *Advanced Microprocessors and Peripherals*, 3rd ed. Tata McGraw Hill, India, 2006.

Reference Books:
1. W. Stallings, Computer Organization and Architecture: Designing for Performance, 8th ed. Pearson Education India, 2016.
2. S. Mathur, Microprocessor 8086: Architecture, Programming and Interfacing. PHI Learning Pvt. Ltd., 2010.
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC301CS	DESIGN AND ANALYSIS OF ALGORITHMS						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	45	15	0	30	40	60	3

Course Objectives:

The objective of the course is to make the students to:

1. Provide an understanding of AI fundamentals, including problem-solving, search algorithms and game-playing techniques.
2. Teach knowledge representation methods and uncertainty handling techniques.
3. Introduce planning techniques such as hierarchical task network, constraint satisfaction and Markov decision process.
4. Provide an understanding of machine learning techniques for solving real-world problems.
5. Explore AI applications in NLP, computer vision while addressing ethical concerns.

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Explain** fundamental algorithm analysis techniques, design paradigms (divide-and-conquer, greedy, dynamic programming), and complexity classes (P, NP, NP-complete).

CO2. **Apply** divide-and-conquer techniques to solve sorting and search problems with recurrence analysis.

CO3. **Implement** greedy, dynamic programming, backtracking, and branch-and-bound strategies for optimization and constraint satisfaction problems.

CO4. **Analyze** NP-completeness proofs and reductions for classical problems like clique and vertex cover.

CO5. **Evaluate** the suitability of different algorithm design paradigms for given problem characteristics.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3- High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3									3		
CO2	3	3	1	3							1			3
CO3	3	3	3	3							3		3	3
CO4	3	3		3							1		3	3
CO5	3	3	1	3			2		1			3	3	3

UNIT - I

Introduction & Elementary Data Structures: Introduction, Fundamentals of algorithm (Line Count, Operation Count), Analysis of algorithms (Best, Average, Worst case), Asymptotic Notations (O, Ω, Θ) Recursive Algorithms, Analysis using Recurrence Relations, Master's Theorem.

Review of elementary data structures–Graphs: BFS, DFS, Articulation points, Bi-Connected Components.

Sets: representation, UNION, FIND operations.

UNIT - II

Divide-and-Conquer Method: The general method, Binary search, Finding maximum and minimum, Merge sort, Quick sort.

Brute Force: Knapsack, Travelling salesman problem, Convex-Hull.

UNIT - III

Greedy Method: Knapsack problem, Minimum spanning trees, Single source shortest path, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge pattern.

Dynamic programming method: All pairs shortest paths, Optimal binary search tress, 0/1 Knapsack problem, Reliability design, Travelling salesman problem.

UNIT - IV

Back tracking: N-queen's problem, Graph coloring, Hamiltonian cycles.

Branch-and-bound: FIFO & LC branch and Bound methods, 0/1 Knapsack problem, Travelling salesperson.

UNIT - V

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem, Proofs for NP Complete Problems: Clique, Vertex Cover.

Text Books:

1. E. Horowitz and S. Sahni, *Fundamentals of Computer Algorithms*, 2nd ed. Universities Press, 2007.
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, *Introduction to Algorithms*, 3rd ed. PHI Learning Pvt. Ltd., 2012

Reference Books:

1. M. T. Goodrich and R. Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, 1st ed. John Wiley & Sons, 2002.
2. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, Design and Analysis of Algorithms, 2nd ed. Pearson Education
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC302CS	SOFTWARE ENGINEERING						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	45	15	0	30	40	60	3

Course Objectives:

The objective of the course is to make the students to:

1. Understand the fundamental concepts, principles, and practices of software engineering.
2. Learn various software development process models and project planning techniques.
3. Develop skills in system modelling using uml diagrams and data flow diagrams (dfds).
4. Gain knowledge of software implementation, testing strategies, and maintenance activities.
5. Familiarize with software quality assurance, configuration management, and recent trends in software engineering.

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Explain** foundational software engineering concepts, including process models, requirement engineering, and UML diagrams.

CO2. **Describe** software testing strategies, product metrics, and risk management frameworks.

CO3. **Select** appropriate process models and architectural styles for given project scenarios.

CO4. **Compare** the effectiveness of validation testing techniques and metrics for software quality assessment.

CO5. **Assess** risk management strategies and their impact on software project success.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3									3		
CO2	3	3	1	1	3									3
CO3	3	3	3		3								3	3
CO4	3	3			3								3	3
CO5	3	3	1		3		2		1			3	3	3

UNIT - I

Software Engineering Fundamentals: Introduction to Software Engineering: Nature and characteristics of software, Software crisis and software myths, Software Process: Prescriptive process models: Waterfall, Incremental, Spiral, Concurrent, Process assessment and improvement (CMMI overview), Agile Development: Agile manifesto and principles, Agile process models: Scrum, Extreme Programming (XP)

UNIT - II

Requirements Engineering and Project Planning: Requirements Engineering: Elicitation, analysis, specification, and validation, Functional and non-functional requirements, Software Requirements Specification (SRS), Software Project Management: Estimation techniques (LOC, Function Points), Scheduling: Gantt charts, PERT, Risk management and mitigation planning

UNIT - III

System Modelling Using UML and Data Flow Diagrams: UML Diagrams for System Modelling: Use Case Diagram, Class Diagram, Sequence Diagram, Activity Diagram, State Chart Diagram, Deployment Diagram, Data Flow Diagrams (DFD): DFD symbols and rules, Context-level DFD, Level 0 and Level 1 DFD, Case-based examples and DFD modelling best practices, Brief Overview of Design Concepts: Abstraction, modularity, cohesion, coupling (only definitions and relevance to modelling)

UNIT - IV

Software Implementation, Testing, and Maintenance: Software Construction: Coding practices, standards, documentation, Software Testing: Testing fundamentals and principles, Unit, integration, system, and acceptance testing, White-box and black-box testing, Test case design techniques, Maintenance and Reengineering: Maintenance types, Software evolution and legacy systems, Basics of reverse engineering

UNIT - V

Software Quality, SCM, and Case Study: Software Quality Assurance: Product and process quality, Software reviews, audits, and metrics, Software Configuration Management (SCM): Version control, change control, repositories

Emerging Trends: DevOps and CI/CD, Cloud-based development practices, Security in software engineering, Ethics in software development,

Case Study: End-to-end analysis of a software development project, From requirements to design (UML/DFD), testing, and deployment, Students interpret or develop partial artifacts for the given system

Text Books:

1. R. S. Pressman, *Software Engineering: A Practitioner's Approach*, 7th ed. McGraw Hill, 2009.
2. I. Sommerville, *Software Engineering*, 7th ed. Addison-Wesley, 2004.
3. R. Mall, *Fundamentals of Software Engineering*, 5th ed. PHI, 2009.

Reference Books:

1. A. Behforooz and F. J. Hudson, Software Engineering Fundamentals. Oxford University Press, 1996.
2. P. Jalote, An Integrated Approach to Software Engineering, 3rd ed. Narosa Publishing House, 2000.
3. J. F. Peters and W. Pedrycz, Software Engineering: An Engineering Approach, 8th ed. John Wiley.
4. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC303CS	DATABASE MANAGEMENT SYSTEMS						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	45	15	0	30	40	60	3

Course Objectives:

The objective of the course is to make the students to:

1. Get familiar with fundamental concepts of database management which includes database design, database languages, and database-system implementation.
2. Get familiar with data storage techniques and indexing.
3. Impart knowledge in transaction management, concurrency control techniques and recovery techniques.
4. Master the basics of SQL and construct queries using SQL.
5. Become familiar with database storage structures and access techniques

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Explain** fundamental database concepts including data models, ER design, relational algebra, normalization, and transaction management principles.

CO2. **Apply** SQL commands including DDL, DML, joins, nested queries and integrity constraints to solve data manipulation problems.

CO3. **Implement** normalization techniques (up to BCNF) to optimize relational database schemas.

CO4. **Analyze** concurrency control protocols and recovery techniques for maintaining transaction integrity.

CO5. **Compare** indexing structures (tree-based vs hash-based) for efficient data retrieval in database systems.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3			1							3	3	1
CO2	3	2			3							3	3	1
CO3	3	3			1							3	3	1
CO4	3	3		1								1	3	2
CO5	3	3		1	1							2	3	1

UNIT - I

Introduction to Database and System Architecture: Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages-DDL and DML, Transaction Management, Database users and Administrators, Database System Structure.

Introduction to Database Design: ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship set, Extended ER Features, Conceptual Design with the ER Model, Logical database Design.

UNIT - II

SQL Queries and Constraints: SQL Data Definition, Types of SQL Commands, Form of Basic SQL Query, SQL Operators, Set Operators, Aggregate Operators, NULL values, Functions, Integrity Constraints Over Relations, Joins, Nested Queries, Introduction to Views,

Destroying/Altering Tables and Views, PL/SQL Functions and Stored procedures, Cursors, Triggers and Active Databases.

UNIT - III

Relational Model: Introduction to Relational Model, Basic Structure, Database Schema, Keys, Relational Algebra and Relational Calculus.

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD

Normal Forms and Normalization: INF,2NF,3NF, BCNF,4NF,5NF, Properties of Decomposition

UNIT - IV

Transaction Management: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability.

UNIT - V

Concurrency Control: Lock based Protocols, Timestamp based protocols, Recovery System: Recovery and Atomicity, Log based recovery, Shadow Paging, Recovery with concurrent Transactions, Buffer Management.

Storage and Indexing: File Organizations and Indexing-Overview of Indexes, Types of Indexes, Index Data Structures, Tree structured Indexing, Hash based Indexing.

Text Books:

1. R. Krishnan and J. Gehrke, *Database Management Systems*, 3rd ed. Tata McGraw Hill.
2. A. Silberschatz and H. F. Korth, *Database System Concepts*, 5th ed. McGraw Hill.
3. C. J. Date, *Introduction to Database Systems*, 8th ed. Pearson Education.
4. P. Rob and C. Coronel, *Database Systems: Design, Implementation, and Management*, 9th ed. Cengage Learning, Inc.

Reference Books:

1. R. Elmasri and S. Navathe, Fundamentals of Database Systems, 7th ed. Pearson Education, 2017.
2. L. Mathew and L. Leon, Database Management System, 1st ed. Tata McGraw-Hill Education, 2013.
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24MC302HS	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE						MC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Basic Knowledge of English	15	0	0	15	40	60	1

Course Objectives:

The objective of the course is to make the students to:

1. Reinforce the students understanding with the pan-Indian heritage in terms of culture, traditions and knowledge.
2. Impart understanding of the importance of the various Indian Languages and Literature.
3. Impart basic knowledge of Indian religion and Philosophies.
4. Impart basic knowledge on Indian Paintings, Dance and Drama, Handicrafts and Indian Architecture.
5. Explore the Sciences, the contribution of scientists and the education system in Ancient, Medieval and Modern India

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Describe** the concepts of Indian culture and Traditions and their importance.
CO2. **Distinguish** the Indian languages.
CO3. **Show** the basic understanding of Indian religion and Philosophy.
CO4. **Show** the basic understanding about the fine arts in India.
CO5. **Analyze** and **apply** the principles of traditional Indian Education to contemporary learning systems.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1			2			3	2	2	2		2			
CO2			2			2	2	2	2		3			
CO3			1			3	3	2	2		3			
CO4			2			3	2	2	2	1	3			
CO5			3			3	2	3	3	2	3			

UNIT - I

Introduction to Indian Culture and heritage

UNIT - II

Indian Languages, Culture and Literature:

-the evolution and role of Sanskrit, significance of scriptures to current society
-Indian philosophies, other Sanskrit literature, literature of south India.
-Northern Indian languages & literature

UNIT - III

Religion and Philosophy:

-Religion and Philosophy in ancient India (Buddhism, Jainism and Shatdarshanas)
-Religion and Philosophy in medieval India

-Religious reform movements in modern India (Brahma Samaj and Arya Samaj)

UNIT - IV

Fine Arts in India (Art, Technology& Engineering):

-Indian Painting, Indian handicrafts

-Music: Divisions of Indian classic music, modern Indian music

-Dance and Drama (classical and folk dance)

-Indian Architecture (Harappa and Mohenjo-Daro, Buddhist Sculpture, Asokan rock cut pillars, Iron pillar of Mehrauli); Medieval- Brihadeeswara temple, Ramappa Temple, Vijayanagar, Hampi and modern) Science and Technology in India.

UNIT - V

Education System in India:

-Education in ancient, medieval and modern India – Women Education in India, National Education Policy-2020

Text Books:

1. K. Kapoor and A. K. Singh, *Indian Knowledge Systems* (2 Vols. Set). New Delhi, India: D. K. Printworld, 2007. ISBN: 9788124603369.
2. Samskrita Bharati, *Science in Samskrit*. New Delhi, India: Samskrita Bharati, 2007. ISBN: 9788187276333.
3. B. K. Mohanta and V. K. Singh, *Traditional Knowledge System and Technology in India*. New Delhi, India: A.P.H. Publishing, 2012. ISBN: 9788177023107.
4. NCERT, *Position Paper, National Focus Group on Arts, Music, Dance and Theatre*. New Delhi, India: NCERT, 2010. ISBN: 81-7450-494-X.
5. B. N. Luniya, *Evolution of Indian Culture*. New Delhi, India: Ina Publishers, 2010.

Reference Books:

1. N. Singhania, Indian Art and Culture, 4th ed. New Delhi, India: McGraw Hill, Dec. 2021. ISBN: 9789354601804.
2. S. Narain, Education and Examination Systems in Ancient India. New Delhi, India: Kalpaz Publications, 2017. ISBN: 9789351282518.
3. S. Prakash, Founders of Sciences in Ancient India. New Delhi, India: Vijay Kumar Publisher, 1989.
4. M. Hiriyanna, Essentials of Indian Philosophy. New Delhi, India: Motilal Banarsidass Publishers, 2005.
5. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC351CS	DATABASE MANAGEMENT SYSTEMS LAB						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	0	0	30	0	40	60	1

Course Objectives:

The objective of the course is to make the students to:

1. Practice various DDL, DML commands in SQL
2. Write simple and Complex queries in SQL
3. Practice various Functions, Joins &sub queries in SQL
4. Write PL/sqlusing cursors and collections
5. Write PL/SQL using Stored Procedures

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Design** and implement a database schema for a given problem
CO2. **Develop** the query statements with the help of structured query language.
CO3. **Populate** and query a database using SQL and PL/SQL
CO4. **Develop** multi-user database application
CO5. **Design** and implement E-R model for the given requirements

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	3			2	1	1	2	3	3	3
CO2	3	3	2		3			1			2	3	3	3
CO3	3	3	2	1	3			1			2	3	3	3
CO4	3	3	3	2	3		1	2	1	2	2	3	3	3
CO5	3	3	3	1	3			1			2	3	2	3

List of Programs:

1. Creation of database Tables (exercising the all SQL commands)
2. Simple and complex condition query creation using SQL Plus
3. Creation of database Tables using Integrity constraints and Functions
4. Simple and complex condition query creation using Joins
5. Simple and complex condition query creation using Sub queries and set operators
6. Creation of Views (exercising the all types of views)
7. Writing PL/SQL function and cursors
8. Writing PL/SQL stored procedure and triggers
9. Creation of Forms and reports for student Information, library information, Pay roll etc.
10. Case Study: Design Database for Bank
    => Collect the information Related with Bank organization
    => Draw E-R Diagrams for Bank
    => Reduce E-R Diagrams to tables
    => Normalize your Database up to 3rd Normal form
    => Retrieve Bank information using SQL commands

LIST OF ADDITIONAL PROGRAMS:

1. Database Backup and Recovery
   - Perform backup of a database using SQL commands or tools.
   - Restore the database from the backup file.
   - Test recovery after accidental data deletion
2. Query Optimization and Indexing
   - Create indexes on selected columns of a table.
   - Compare query execution time with and without indexes.
   - Analyze the query execution plan for optimization.

Text Books:

1. R. Ramakrishnan and J. Gehrke, *Database Management Systems*, 3rd ed. New Delhi, India: Tata McGraw-Hill, 2003.
2. A. Silberschatz, H. F. Korth, and S. Sudarshan, *Database System Concepts*, 5th ed. New York, NY, USA: McGraw-Hill, 2006.

Reference Books:

1. R. Elmasri and S. B. Navathe, *Fundamentals of Database Systems*. Pearson Education, 2017.
2. L. Mathew and L. Leon, *Database Management System*. Tata McGraw-Hill Education, 2013.

Course Code	Course Title						Core / Elective
M24PC352CS	JAVA PROGRAMMING LAB						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Programming and Problem Solving	0	0	60	0	40	60	2

Course Objectives:

The objective of the course is to make the students to:

1. Implement various java concepts.
2. Write java programs to solve mathematics, science and engineering problems.
3. Identify compile time and runtime errors, syntax and logical errors
4. Import the essentials of java class library and user defined packages.
5. Develop skills in internet programming using applets and swings

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Demonstrate** the use of Object-Oriented Programming concepts.
CO2. **Develop** Java program using packages, inheritance and interface.
CO3. **Develop** java programs to implement error handling techniques using exception handling.
CO4. **Develop** graphical user interface using AWT.
CO5. **Demonstrate** event handling mechanism

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2		3			1	1		2	2	3	2
CO2	3	3	3		3			2			2	3	3	3
CO3	3	3	3	1	3			1			2	3	3	3
CO4	3	3	3		3			2	1		2	3	3	3
CO5	3	3	3		3			2	1		2	3	3	3

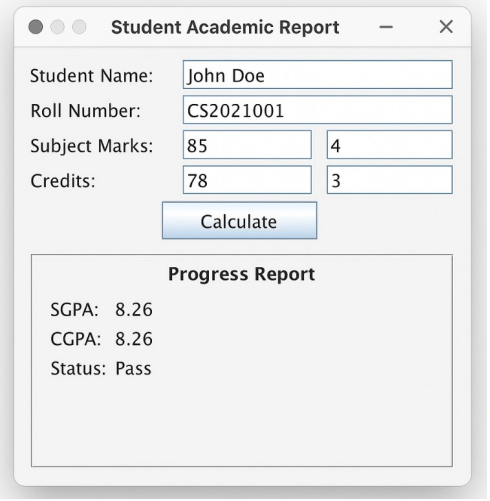
List of Programs

1. Implement the concept of classes and objects.
2. Implement Arrays to a given application.
3. Use String and String Tokenizer classes and develop java programs.
4. Develop a java programs using interfaces and packages.
5. Develop Java Programs using inheritance.
6. Develop Java programs using Method overloading and method overriding.
7. Develop java programs using Exception handling (using try, catch, throw, throws and finally).
8. Develop java programs using Multithreading (using Thread class and Runnable interface, synchronization).
9. Develop java programs using collections (using list, set, Map and generics).
10. Write a Java program that handles all mouse events and shows the event name at the

center of the window when a mouse event is fired. [Use Adapter classes]

11. Write a program to perform CRUD operations on the student table in a database using JDBC.
12. CASE STUDY: Design and develop a Java application to calculate and display the SGPA and CGPA of a student. The application should provide a graphical user interface (GUI) using Java Swings for inputting student details and marks. The calculated SGPA

    and CGPA, along with the student's progress report, should be displayed using an Applet interface. Additionally, the application should establish a connection with a backend database using JDBC to store and retrieve student academic records.



LIST OF ADDITIONAL PROGRAMS:

1. Design a calculator using AWT components
2. Demonstrate simple file transfer between client and server

Text Books:

1. H. Schildt and D. Coward, Java: The Complete Reference, 13th ed. New Delhi, India: McGraw Hill Education, 2023.
2. S. Malhotra and S. Choudhary, Programming in Java, 2nd ed. New Delhi, India: Oxford University Press, 2013.
3. https://ekumbh.aicte-india.org/book.php

Reference Books:

1. J. Bloch, Effective Java, 3rd ed. Boston, MA, USA: Addison-Wesley, 2018.
2. C. S. Horstmann, Core Java, Volume I—Fundamentals and Volume II—Advanced Features, 12th ed. Upper Saddle River, NJ, USA: Prentice Hall, 2022.

SKILL ENHANCEMENT COURSE

Guidelines for Evaluation of Skill Enhancement Course

1. Continuous Evaluation method is adopted for skill enhancement courses of all semesters and 40 marks are allocated for CIE.
   At the end of each module, the student is evaluated by allocating marks as given under.

Observation	: 10 marks
Continuous Performance and Execution	: 20 marks
Viva-Voce	: 10marks

   Average of marks obtained in all experiments is considered as the marks obtained in CIE

2. The Semester End Examination shall be conducted with an external examiner and the internal examiner for 60 marks. The external examiner shall be appointed by the Principal from the panel of examiners recommended by Controller of Evaluation and Board of Studies.

Quiz/ Skill Test/Assignment/ Mini Project	: 40 marks
Viva-Voce	: 20 marks

Course Code	Course Title						Core / Elective
M24SE351CS	SKILL ENHANCEMENT COURSE-IOT						SE
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	0	0	30	0	40	60	1

Course Objectives:
The objective of the course is to make the students to: to

1. Learn how digital transformation turns information into action, creating unprecedented economic opportunity.
2. Understand how the IoT brings together operational technology and information technology systems.
3. Discover how business processes for evaluating and solving problems are being transformed.
4. Learn the security concerns that must be considered when implementing IoT solutions.
5. Practice what you learn using Cisco Packet Tracer, a network configuration simulation tool.

Course Outcomes:
After the completion of course the students will be able to:

CO1. **Explain** the meaning and impact of Digital Transformation.
CO2. **Apply** basic programming to support IoT devices.
CO3. **Explain** how data provides value to Digital Business and Society.
CO4. **Explain** the benefits of automation in the digitized world.
CO5. **Explain** the need for enhanced security in the digitized world and discover opportunities provided by digital transformation.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	2								2		
CO2	3	2	1									3		
CO3	3	2	3	2	2							3		
CO4	3	2	1	1								3	1	1
CO5	3	2	3	2	2							3	3	3

MODULE 1: Everything is Connected
Digital Transformation: Explain how digital transformation affects business, industry, and our daily lives, explain how digital transformation enables innovation, explain how networks provide the platform for Digital Business and society.
Devices that Connect to the IoT: Configure an IoT device to connect to the network, describe the exponential growth of connected IoT devices, configure devices to communicate in the IoT

MODULE 2: Everything Becomes Programmable
Apply Basic Programming to Support IoT Devices: Use Python to create programs that accept user input and read and write to external files, Describe basic programming variables and fundamentals. Apply basic programming variables and fundamentals in Blockly. Apply

basic programming variables and fundamentals using Python
Prototyping Your Idea: Explain prototyping and its purpose,Describe Prototyping, Describe the various tools and materials to use to prototype.
MODULE 3: Everything Generates Data
Big Data: Explain the concept of Big Data, Describe the sources of Big Data, Explain the challenges and solutions to Big Data storage, Explain how Big Data analytics are used to support Business.

MODULE 4: Everything Can be Automated
What Can be Automated?: Explain how digitization allows business processes to embrace automation, Describe automation Explain how artificial intelligence and machine learning impact automation. Explain how intent-based networking adapts to changing business needs.

MODULE 5: Everything Needs to be Secured
Security in the Digitized World: Explain why security is important in the digitized world. Explain the need for security in the digitized world, explain how to help secure the corporate world, and explain how to secure personal data and devices.

References:

1. Introduction to IoT by CISCO Network Academy, Version 2.0,July 2018
2. https://ekumbh.aicte-india.org/book.php

IV SEMESTER SYLLABUS

Scheme of Instruction & Examination
B. E. - Computer Science and Engineering

CSE Semester - IV									
S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
Theory Courses									
1	M24PC404CS	Discrete Structures	3	0	0	3	40	60	3
2	M24PC405CS	Data Mining and Data Analytics	3	0	0	3	40	60	3
3	M24PC406CS	Operating Systems	3	0	0	3	40	60	3
4	M24PC407CS	Computer Networks	3	0	0	3	40	60	3
5	M24HS402HS	Human Values Professional Ethics	2	0	0	2	40	60	2
6	M24PC408CS	MOOCS	0	0	0	0	0	0	3
Practical / Laboratory Courses									
7	M24PC453CS	Operating Systems Lab	0	0	2	2	40	60	1
8	M24PC454CS	Computer Networks Lab	0	0	2	2	40	60	1
9	M24PC455CS	Python Programming Lab	0	0	2*2	4	40	60	2
10	M24SE452CS	Skill Enhancement Course – CISCO CCNA Module I	0	0	2	2	40	60	1
		Total	**14**	**0**	**10**	**24**	**360**	**540**	**22**

****Bridge Courses being offered to Lateral Entry admitted students****

S. No	Semester	Subject Code	Subject Name	Credits
1	IV	M24BR401CE	Environmental Science	0
2	IV	M24BR451HS	Sports / Yoga / NSS	0

NOTE: In accordance with the National Credit Framework (NCrF), which defines 1 credit as equivalent to 30 hours of learning, the conventional L: T: P (Lecture: Tutorial: Practical) distribution has been mapped to Notional Hours, as reflected in the table below.

CSE Semester - IV										
S. No.	Course Code	Course Title	Scheme of Instruction					Scheme of Examination		Credits
			Notional Hours					Maximum Marks		
			L	T	P/PW	TW/SL	Total Notional Hours	CIE	SEE	
Theory Courses										
1	M24PC404CS	Discrete Structures	45	15	0	30	90	40	60	3
2	M24PC405CS	Data Mining and Data Analytics	45	15	0	30	90	40	60	3
3	M24PC406CS	Operating Systems	45	15	0	30	90	40	60	3
4	M24PC407CS	Computer Networks	45	15	0	30	90	40	60	3
5	M24HS402HS	Human Values & Professional Ethics	30	0	0	30	60	40	60	2
6	M24PC408CS	MOOCS	0	0	0	90	0	0	0	3
Practical / Laboratory Courses										
7	M24PC453CS	Operating Systems Lab	0	0	30	0	30	40	60	1
8	M24PC454CS	Computer Networks Lab	0	0	30	0	30	40	60	1
9	M24PC455CS	Python Programming Lab	0	0	60	0	60	40	60	2
10	M24SE452CS	Skill Enhancement Course – CISCO CCNA Module I	0	0	30	0	30	40	60	1
		Total	**210**	**60**	**150**	**240**	**570**	**360**	**540**	**22**

Course Code	Course Title						Core / Elective
M24PC404CS	DISCRETE STRUCTURES						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	45	15	0	30	40	60	3

Course Objectives:

The objective of the course is to make the students to:

1. Understand the concepts of Logic, Rules of inference and Quantifiers
2. Explain with examples, the basic terminology of functions, relations, and sets.
3. Understand the basic concept of combinatorics.
4. Relate the ideas of mathematical induction to recursion and recursively defined structures.
5. Develop Graph Algorithms by using the concepts of Graphs and Trees

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Explain** the fundamental concepts of mathematical logic, set theory, algebraic structures, recurrence relations, and graph theory.

CO2. **Apply** logical connectives, truth tables, and rules of inference to construct formal proofs and demonstrate set operations, relations, and functions to solve discrete structures problems.

CO3. **Formulate** algebraic systems (groups, rings) and combinatorial principles (inclusion-exclusion, pigeonhole) to solve counting problems.

CO4. **Analyze** recurrence relations and generating functions to model divide-and-conquer algorithms.

CO5. **Compare** graph models (Euler/Hamilton paths) and tree structures (spanning trees) for real-world applications.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3			2							3	3	
CO2	3	3			2							3	3	
CO3	3	3										3	2	
CO4	3	3			1							2	3	
CO5	3	3			1							2	3	1

UNIT - I

Mathematical Logic: Statements and notations, Connectives, Well-formed formulas, Tru Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers.

Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving

UNIT - II

Set Theory and Relations: Basic Concepts of Set Theory, Relations and Ordering, Properti of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relation Hasse Diagram.

Functions: Composition of functions, Inverse Functions, Recursive Functions, Lattice and i Properties

UNIT - III

Elementary Combinatorics: Basis of counting, Combinations & Permutations, wi repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, tl principles of Inclusion – Exclusion. Pigeon hole principles and its application.

UNIT - IV

Recurrence Relations: Recurrence Relations, Solving Linear Recurrence Relations, Divid and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusio Applications of Inclusion-Exclusion.

UNIT - V

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Subgraphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Euler Circuits, Planar Graphs, Graph Coloring, Chromatic Numbers

Trees: Introduction to Trees, Properties, Applications of Trees, Tree Traversal, Spanning Trees, Directed Trees, Binary Trees.

Text Books:

1. K. H. Rosen, *Discrete Mathematics and Its Applications*, 5th ed. New Delhi, India: McGraw Hill Education, 2017.
2. C. L. Liu and D. P. Mohapatra, *Elements of Discrete Mathematics: A Computer Oriented Approach*, 3rd ed. New Delhi, India: Tata McGraw Hill, 2017.
3. J. L. Mott, A. Kandel, and T. P. Baker, *Discrete Mathematics for Computer Scientists and Mathematicians*, 2nd ed. New Delhi, India: PHI Learning, 2015.

Reference Books:

1. D. S. Malik and M. K. Sen, Discrete Mathematical Structures: Theory and Applications, 1st ed. Boston, MA, USA: Cengage Learning, 2012.
2. T. Koshy, Discrete Mathematics with Applications, 1st ed. Burlington, MA, USA: Elsevier, 2005.
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC405CS	DATA MINING AND DATA ANALYTICS						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	45	15	0	30	40	60	3

Course Objectives:

The objective of the course is to make the students to:

1. Introduce the basic concepts of Data Warehouse and Data Mining
2. Introduce current trends in data mining
3. Write association rules for a given data pattern. Choose between classification and clustering solution.
4. Understand the fundamental concepts of data analytics.
5. Explore data preprocessing, visualization, and statistical analysis techniques.

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Explain** fundamental concepts of data warehousing architectures, OLAP operations, and data mining processes including preprocessing and similarity measures.

CO2. **Apply** association rule mining techniques (Apriori, FP-Growth) to discover frequent patterns in transactional datasets.

CO3. **Implement** classification algorithms (decision trees, Bayesian, SVM) for predictive modeling tasks.

CO4. **Analyze** clustering techniques (partitioning, hierarchical, density-based) for customer segmentation problems.

CO5. **Evaluate** the effectiveness of different data mining approaches (association, classification, clustering) for given business scenarios.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	3							3	1	1
CO2	3	3	3		3							3		3
CO3	3	1	3	1	3							3	1	
CO4	3		3	1	3				1		1	3	1	1
CO5	3	2		1	3							3	2	

UNIT - I

Data Warehouse: A Brief History, Characteristics, Architecture for a Data Warehouse. Fact and Dimension Tables

Data Mining: Introduction, Motivation, Knowledge Discovery Process, Data Mining Functionalities, Major issues, Data Pre-processing

Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm.

UNIT - II

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision, Tree Introduction, Bayesian Classification, Rule Based Classification, Classification by Back propagation, Support Vector Machines, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor.

Case Study: Loan Default Prediction – Using decision trees to predict whether a customer will default on a loan.

UNIT - III

Cluster Analysis: Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

UNIT - IV

Data Analytics: Ways of Thinking About Data, Qualitative and Quantitative Data, And Data Strategies, Conceptualizing Data Analysis as a Process, Managing Data Analysis Process, **Exploratory Data Analysis**: Exploring a New Dataset, Summarizing Numeric Data, Anomalies in Numeric Data, Visualizing Relations between Variables. Working with External Data: Manual Data Entry, CSV Files, Other Files, Merging Data from Different Sources.

UNIT - V

Basic Analysis Techniques: Statistical hypothesis generation and testing**,** Chi-Square test**,** t-Test**,** Analysis of variance**,** Correlation analysis**,** Maximum likelihood test**,** Practice & analysis with R

Text Books:

1. P.-N. Tan, M. Steinbach, and V. Kumar, *Introduction to Data Mining*, 1st impression. New Delhi, India: Pearson Education, 2014.
2. J. Han, M. Kamber, and J. Pei, *Data Mining: Concepts and Techniques*, 3rd ed. Waltham, MA, USA: Morgan Kaufmann Publishers, 2012.
3. R. A. Irizarry, *Introduction to Data Science: Data Analysis and Prediction Algorithms with R*, 1st ed. Boca Raton, FL, USA: Chapman and Hall/CRC, 2019.

Reference Books:

1. S. Anahory and D. Murray, Data Warehousing in the Real World, 10th impression. New Delhi, India: Pearson Education, 2012.
2. M. J. Berry and G. S. Linoff, Mastering Data Mining, 2nd ed. Hoboken, NJ, USA: Wiley, 2012.
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC406CS	OPERATING SYSTEMS						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	45	15	0	30	40	60	3

Course Objectives:

The objective of the course is to make the students to:

1. Provide a comprehensive understanding of the fundamental principles, functions, and services of operating systems in managing hardware and software resources.
2. Enable students to learn various concepts of process management, thread handling, synchronization techniques, and inter-process communication.
3. Impart knowledge on memory management strategies, virtual memory concepts, and page replacement policies to optimize system performance.
4. Develop an understanding of file systems, i/o device management, and storage techniques for efficient data handling and system operations.
5. Expose students to modern operating system features such as virtualization, security mechanisms, and system architectures through real-world case studies like windows 11.

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Demonstrate** familiarity with fundamental concepts, terminologies, and principles of operating systems and their role in managing system resources.

CO2. **Explain** and **summarize** system structures, process and memory management, file systems, I/O handling, virtualization, and security features as applied in modern systems.

CO3. **Apply** suitable algorithms, techniques, and tools to address problems related to process management, memory allocation, file operations, I/O management, and system-level resource utilization.

CO4. **Analyze** and **differentiate** operating system strategies and architectures to assess their efficiency, reliability, and security, referring to practical implementations.

CO5. **Evaluate** and **justify** the selection of various operating system approaches for optimal system performance, resource management, and security, drawing insights from real-world platforms.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3										3		
CO2	3	3										3		1
CO3	3	3	3									3		3
CO4		3		3								1		3
CO5	3	3	3	3	1				1			3		3

UNIT - I

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine.

Processes: Definition, Process Relationship, Different states of a Process, Process Statetransitions, Process Control Block (PCB), Context switching

UNIT - II

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling Criteria, Scheduling algorithms, multiprocessor scheduling

UNIT - III

Process Synchronization: Inter-process Communication, Critical Section, Race Conditions, Mutual Exclusion, Peterson's Solution, Classical problems of synchronization: The Bounded buffer problem, Producer\Consumer Problem, reader's & writer problem, Dinning philosopher's problem. Semaphores, Event Counters, Monitors, Message Passing,

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Methods for Handling: Deadlocks: Deadlock prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT - IV

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation, fragmentation and Compaction; Paging: Principle of operation, Page allocation, Hardware support for paging, structure of page table, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory, Hardware and control structures, Locality of reference, Page fault, Working Set, Dirty page/Dirty bit, Demand paging, Page Replacement algorithms, Trashing

UNIT - V

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods, Free-space management, directory implementation, efficiency and performance.

Secondary-Storage Structure: Disk structure, Disk scheduling algorithms, Disk Management, RAID structure.

Case Study: *"Operating System Case Study – Windows 11: Process and Memory Management, File Systems, I/O Management, Security Features, Virtualization, and System Architecture."*

Text Books:

1. A. Silberschatz, P. B. Galvin, and G. Gagne, *Operating System Concepts Essentials*, 9th ed. Hoboken, NJ, USA: Wiley Asia Student Edition, 2017.
2. W. Stallings, *Operating Systems: Internals and Design Principles*, 5th ed. New Delhi, India: Prentice Hall of India, 2016.
3. A. S. Tanenbaum, *Modern Operating Systems*, 2nd ed. New Delhi, India: Prentice Hall of India, 2007.

Reference Books:

1. M. J. Bach, The Design of the UNIX Operating System, 8th ed. New Delhi, India: Prentice Hall of India, 2009.
2. D. P. Bovet and M. Cesati, Understanding the Linux Kernel, 3rd ed. Sebastopol, CA, USA: O'Reilly Media, 2005.
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC407CS	COMPUTER NETWORKS						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	45	15	0	30	40	60	3

Course Objectives:

The objective of the course is to make the students to:

1. Provide a conceptual foundation for the study of data communications using the open Systems interconnect (OSI) model for layered architecture.
2. Study the principles of network protocols and internetworking
3. Understand the Network security and Internet applications.
4. Understand the performance of data link layer protocols for error and flow control.
5. Understand various routing protocols and network security.

Course Outcomes:

After the completion of course the students will be able to:

CO1. Describe the fundamental concepts of data communication, network models, transmission media, switching techniques, and application layer protocols.

CO2. Apply framing, error detection (and flow control protocols to ensure reliable data transmission.

CO3. Implement IP addressing, subnetting, and congestion control algorithms for efficient network resource management.

CO4. Analyze routing algorithms and multiple access protocols to optimize network performance.

CO5. Evaluate the role of transport layer protocols and QoS techniques in ensuring end-to-end communication reliability.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2			1				1		2	2		1
CO2	3	3	2	2	2						2	3	1	2
CO3	3	3	3	2	2			1			2	3	2	3
CO4	3	3	2	3	2						2	3	1	2
CO5	3	3		3	2	1	1		2		3	3		2

UNIT - I

Introduction to Data communication: Representation of data communication, flow of networks, Network Types: LAN, WAN, MAN. Network Topologies: Bus, Star, Ring, Hybrid. Line configurations. Reference Models: OSI, TCP/IP, Transmission media

Techniques for Bandwidth utilization: Multiplexing –Frequency division, time division and wave division, Asynchronous and synchronous transmission.

UNIT - II

Data Link Layer: Framing, Error Detection and Correction: Fundamentals, Block coding, Hamming Distance, CRC

Flow Control and Error Control Protocols: Stop and Wait, go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, HDLC

Multiple Access Protocols: ALOHA, CSMA, CSMA/CD, CSMA/CA.

UNIT - III

The Network Layer in Internet: IPV4, IPV6, IP Addressing, NAT.

Internet Networking: Tunnelling, Fragmentation, Congestion Control (Leaky Bucket and Token Bucket Algorithm), and Internet control protocols: ARP, RARP and DHCP

UNIT - IV

Network Layer: Switching Techniques (Circuit and Packet) concept, Network layer Services, Sub-netting concepts

Routing algorithms: Shortest Path Routing, Flooding, Hierarchical routing, Broadcast, Multicast, Distance Vector Routing

UNIT - V

Transport Layer: Transport Services, Elements of Transport Layer, Connection management, TCP and UDP protocols, QoS improving techniques.

Application Layer: Domain Name System, SNMP, SMTP, HTTP, Bluetooth

Text Books:

1. A. S. Tanenbaum, *Computer Networks*, 5th ed. New Delhi, India: Pearson Education, 2011.
2. B. A. Forouzan, *Data Communications and Networking*, 4th ed. New Delhi, India: Tata McGraw-Hill, 2008.
3. W. Stallings, *Data and Computer Communications*, 8th ed. New Delhi, India: PHI Learning, 2004.

Reference Books:

1. D. E. Comer, Computer Networks and Internets. Singapore: Pearson Education Asia, 2000.
2. P. C. Gupta, Data Communications and Computer Networks. New Delhi, India: PHI Learning, 2013.
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24HS402HS	HUMAN VALUES AND PROFESSIONAL ETHICS						HS
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	30	0	0	30	40	60	2

Course Objectives:

The objective of the course is to make the students to:

1. Create awareness on Human Values and Engineering Ethics.
2. Move from discrimination to commitment.
3. Understand social responsibility of an engineer.
4. Appreciate ethical dilemma while discharging duties in professional life.
5. Encourage students to discover what they consider valuable in life

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Relate** the significance of value inputs and start applying them in their life and profession.
CO2. **Compare** and **contrast** between values and skills, happiness and accumulation of physical facilities with regard to the self and the body, intention and competence of an individual etc.
CO3. **Apply** ethical values in the light of the problems from the perspective of the social context.
CO4. **Discuss** the role of a human being in ensuring harmony in society and nature.
CO5. **Identify** the difference between ethical and unethical practices and apply ethical practices in personal and professional lives.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1							3	3	3		3			
CO2							3	3	3		3			
CO3							3	3	3		3			
CO4							3	3	3		3			
CO5							3	3	3		3			

UNIT - I

Introduction to Value Education

1. Value Education, Definition, Concept and Need for Value Education
2. The Content and Process of Value Education
3. Self-Exploration as a means of Value Education
4. The basic human aspirations- Continuous Happiness and Prosperity

UNIT - II

Harmony in the Human Being

1. Human Being is more than just the Body
2. Harmony of the Self ('I') with the Body
3. Understanding myself as co-existence of the self and the body

a. Needs of the self and the needs of the body
b. Activities in the self and activities in the body.

UNIT - III

Harmony in the Family and Society and Harmony in Nature

1. Family as a basic unit of Human Interaction
2. Understanding the values in human relationships- Trust, Respect, Affection, Care, Guidance, Reverence, Glory, Gratitude and Law.
3. Identification of comprehensive human goals.
4. The five dimensions of human endeavours.

UNIT - IV

Social Ethics

1. The Basics for Ethical Human conduct
2. Challenges to ethical conduct in existence
3. Harmony in nature- Understanding the interconnectedness and mutual fulfilment.
4. Harmony in existence – Understanding existence as co-existence

UNIT - V

Professional Ethics

1. Professional ethics in the light of right understanding.
2. Definitiveness of Ethical Human Conduct
   Basics for Humanistic Education

Text Books:

1. R. R. Gaur, R. Sangal, and G. P. Bagaria, A Foundation Course in Value Education. New Delhi, India: Excel Books, 2009.
2. A. N. Tripathy, Human Values. New Delhi, India: New Age International Publishers, 2003.
3. B. L. Bajpai, Indian Ethos and Modern Management. Lucknow, India: New Royal Book Co., reprinted 2004.
4. B. Russell, Human Society in Ethics and Politics. Abingdon, UK: Taylor and Francis, 2007.

Reference Books:

1. C. Lamont, Philosophy of Humanism. Washington, DC, USA: Humanist Press, 1997.
2. R. R. Gaur, R. Sangal, and G. P. Bagaria, Teacher's Manual. New Delhi, India: Excel Books, 2009.
3. M. J. Adler, What Man Has Made of Man. New York, NY, USA: Macmillan, 2007.
4. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC453CS	OPERATING SYSTEMS LAB						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	0	0	30	0	40	60	1

Course Objectives:

The objective of the course is to make the students to:

1. Learn various system calls in Linux
2. Learn different types of CPU scheduling algorithms.
3. Demonstrate the usage of semaphores for solving synchronization problem
4. Understand memory management techniques and different types of fragmentation.
5. Learn various disk scheduling algorithms

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Use** different system calls for writing application programs
CO2. **Evaluate** the performance of different types of CPU scheduling algorithms.
CO3. **Implement** producer-consumer problem, reader-writer's problem, Dining philosopher's problem.
CO4. **Simulate** Banker's algorithm for deadlock avoidance.
CO5. **Implement** paging replacement and disk scheduling techniques

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2		1	3				2		2	2	1	2
CO2	3	3	2	2	3				1		2	2	3	3
CO3	3	3	3	2	3			1	1		2	2	3	3
CO4	3	3	2	3	3	1					2	2	2	3
CO5	3	3		3	3		1	2	2		3	2	1	2

List of Programs (preferred programming language is C)

Perform a case study by installing and exploring various types of operating systems on a physical or logical (virtual) machine

1. Write C programs to implement UNIX system calls & file management system calls.
2. Write C programs to demonstrate various process related concepts.
3. Write C programs to demonstrate various thread related concepts.
4. Write C programs to simulate CPU scheduling algorithms: FCFS, SJF, Round Robin
5. Write C programs to simulate Intra & Inter-Process Communication (IPC) techniques: Pipes, Messages Queues, Shared Memory.
6. Write C programs to simulate solutions to Classical Process Synchronization Problems: Dining Philosophers, Producer-Consumer, Readers-Writers
7. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
8. Write C programs to simulate Page Replacement Algorithms: FIFO, LRU
9. Write C programs to simulate implementation of Disk Scheduling Algorithms: FCFS, SSTF.

10. Shell programming: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, and commands).

LIST OF ADDITIONAL PROGRAMS:

1. Write a C program for Zombie and Orphan process demonstration
2. Write a C program to implement IPC using FIFO (Named Pipe)

Text Books:

1. W. Richard Stevens and S. A. Rago, Advanced Programming in the UNIX® Environment, 3rd ed., Boston, MA, USA: Addison-Wesley, 2013.
2. Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, Operating System Concepts, 10th ed., Hoboken, NJ, USA: John Wiley & Sons, 2018.

Reference Books

1. M. Kerrisk, The Linux Programming Interface: A Linux and UNIX System Programming Handbook, San Francisco, CA, USA: No Starch Press, 2010.
2. Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau, Operating Systems: Three Easy Pieces, 1st ed., Arpaci-Dusseau Books, 2018

Course Code	Course Title						Core / Elective
M24PC454CS	COMPUTER NETWORKS LAB						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	0	0	30	0	40	60	1

Course Objectives:

The objective of the course is to make the students to:

1. Learn to communicate between two desktops
2. Learn to implement different protocols
3. Be familiar with socket programming
4. Be familiar with various routing algorithms
5. Be familiar with different simulation tools

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Demonstrate** a broad knowledge of the area of computer networking and its terminology
CO2. **Demonstrate** the ability to configure intermediary network devices
CO3. **Design** and **implement** networked applications using sockets
CO4. **Use** simulation tools to analyze the performance of various network protocols
CO5. **Implement** and **analyze** various routing algorithms.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2		1	3				2		2	2	1	2
CO2	3	3	2	2	3				1		2	2	3	3
CO3	3	3	3	2	3			1	1		2	2	3	3
CO4	3	3	2	3	3	1					2	2	2	3
CO5	3	3		3	3		1	2	2		3	2	1	2

List of Programs

1. Running and using services/commands like tcpdump, netstat, ifconfig, nslookup, FTP, TELNET and trace route. Capture ping and trace route PDUs using network protocol analyzer and examine
2. Implement the data link layer framing methods such as character-stuffing and bit stuffing
3. Implement on a dataset of characters using CRC polynomials CRC 12 and CRC 16
4. Initial Configuration of router and switch (using real devices or simulators)
5. Design and implement the following experiments using packet tracer software
6. Simulation of network topologies
7. Configuration of network using different routing protocols
8. Do the following using NS2/NS3/NetSim or any other equivalent tool
    a. Simulation of Congestion Control Algorithms
    b. Simulation of Routing Algorithms
9. Socket programming using UDP and TCP (e.g simple DNS, date & time client/server, echo client/server, iterative & concurrent servers)
10. Programming using RPC

LIST OF ADDITIONAL PROGRAMS:

1. Implement Error Detection using Checksum
2. Implement Distance Vector Routing Algorithm

Text Books:

1. J. F. Kurose and K. W. Ross, Computer Networking: A Top-Down Approach, 8th ed., Boston, MA, USA: Pearson, 2021.
2. A. S. Tanenbaum and D. J. Wetherall, Computer Networks, 5th ed., Boston, MA, USA: Pearson, 2011.

Reference Books:

1. B. A. Forouzan, Data Communications and Networking, 5th ed., New York, NY, USA: McGraw-Hill, 2017.
2. W. R. Stevens, TCP/IP Illustrated, Volume 1: The Protocols, Boston, MA, USA: Addison-Wesley, 2011.

Course Code	Course Title						Core / Elective
M24PC455CS	PYTHON PROGRAMMING LAB						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	0	0	60	0	40	60	2

Course Objectives:

The objective of the course is to make the students to:

1. Learn how to design and program using lists, tuples, and dictionaries.
2. Learn how to use indexing and slicing to access data in Python programs.
3. Learn structure and components of a Python and to read and write files.
4. Learn how to design object-oriented programs with Python classes and Exception handling techniques.
5. Learn how to design and build the GUI applications using python

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Develop** solutions to simple computational problems using Python programs.
CO2. **Solve** problems using conditionals and loops in Python.
CO3. **Develop** Python programs by defining functions and calling them.
CO4. **Use** Python lists, tuples and dictionaries for representing compound data.
CO5. **Develop** Python programs for GUI applications

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2		1	3				2		2	2	1	2
CO2	3	3	2	2	3				1		2	2	3	3
CO3	3	3	3	2	3			1	1		2	2	3	3
CO4	3	3	2	3	3	1					2	2	2	3
CO5	3	3		3	3		1	2	2		3	2	1	2

List of Programs:

1. Develop program to demonstrate different number datatypes in python
2. Develop program to understand the control structures of python
3. Develop program on String manipulation
4. Develop program to perform various operations on files
5. Develop programs to learn different types of structures (list, dictionary, tuples) in python
6. Develop programs to learn concept of functions scoping, recursion and list mutability
7. Develop program to demonstrate classes and OOP principles
8. Develop programs to understand working of exception handling and assertions
9. Develop event driven GUI programs
10. Explore different debugging methods in Python: A Case Study

LIST OF ADDITIONAL PROGRAMS:

1. Develop program to demonstrate JSON in Python
2. Develop program to demonstrate Python RegEx

Text Books:

1. K. A. Lambert, *The Fundamentals of Python: First Programs*, 2nd ed. Boston, MA, USA: Cengage Learning, 2017.
2. J. V. Guttag, *Introduction to Computation and Programming Using Python*. New Delhi, India: Prentice Hall of India, 2016.

Reference Books:

1. M. Summerfield, Programming in Python 3: A Complete Introduction to the Python Language. Boston, MA, USA: Addison-Wesley Professional, 2009.
2. A. B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd ed., updated for Python 3. Mumbai, India: Shroff/O'Reilly Publishers, 2016.
3. NPTEL Course, Programming, Data Structures and Algorithms using Python, Link: https://nptel.ac.in/courses/106106145
4. NPTEL Course, The Joy of Computing using Python, Link: https://nptel.ac.in/courses/106106182
5. FOSSEE, Python, Link: https://python.fossee.in/

Course Code	Course Title						Core / Elective
M24SE452CS	SKILL ENHANCEMENT COURSE – CISCO CCNA MODULE I						PW
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	0	0	30	0	40	60	1

Course Objectives:

The objective of the course is to make the students to:

1. Explain the advances in modern network technologies, configure IP address, passwords etc
2. Explain how network protocols enable devices to access local and remote network resources
3. Explain how routers use network layer protocols and services to enable end-to-end connectivity
4. Implement IPv4 and IPv6 addressing scheme
5. Configure a switch port to be assigned to a VLAN based on requirements.

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Build** simple LANs, perform basic configurations for routers and switches,
CO2. **Implement** IPv4 and IPv6 addressing schemes.
CO3. **Implement** VLANs and trunking in a switched network
CO4. **Implement** DHCPv4 to operate across multiple LANs and explain how WLANs enable network connectivity.
CO5. **Develop** critical thinking and problem-solving skills using real equipment and Cisco Packet Tracer

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3				2							3		
CO2	3	2			2							3		
CO3	3	2			3							3		
CO4	3	2			3							3		
CO5	3	3	2		3							3		

MODULE I

Networking today: Network Affect our Lives, Network Components, Network topologies, Types of Networks

Basic Switch and End Device Configuration: IOS Access, Command Structure, basic device configuration, Ports and addresses, configuring IP address, protocols and models

MODULE II

Physical Layer: Introduction to cables, Number Systems

Data Link Layer: Topologies, Data Link frame

Ethernet Switching: Ethernet Frame, MAC Address Table

MODULE III:

Network layer: IPv4 and IPv6 packet, addressing of IPv4 and IPv6

Address Resolution: MAC & IP, ARP, IPv6 Neighbour Discovery
MODULE IV:
ICMP, Transport layer: TCP & UDP
Application Layer: Web and email protocols, IP Addressing Services

MODULE V:
Network Security Fundamentals: Network Attacks, Device Security

References:
CCNA ROUTING & SWITCHING BY CISCO PRESS