DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE)

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

(Artificial Intelligence)

M24 CURRICULUM

Methodist College of Engineering & Technology

Affiliated by Osmania University Hyderabad, Approved by AICTE,
New Delhi, King Koti Road, Abids, Hyderabad, Telangana 500 001.

VISION

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

MISSION

- To offer flexible programs of study with collaborations to suit industry needs.
- To provide quality education and training through novel pedagogical practices.
- To expedite high performance of excellence in teaching, research and innovations.
- 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. – CSE (Artificial Intelligence)

CSE(AI) 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. – CSE (Artificial Intelligence)

CSE(AI) 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	M24PC301AI	Discrete Structures	3	0	0	3	40	60	3
3	M24PC302AI	Operating Systems	3	0	0	3	40	60	3
4	M24PC303AI	Database Management Systems	3	0	0	3	40	60	3
5	M24PC304AI	Statistical Analytics and Computing using Python Programming	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	M24PC351AI	Operating Systems Lab	0	0	2	2	40	60	1
8	M24PC352AI	Database Management Systems Lab	0	0	2	2	40	60	1
9	M24PC353AI	Statistical Analytics and Computing using Python Programming Lab	0	0	2	2	40	60	1
10	M24SE351AI	Skill Enhancement Course - IOT	0	0	2	2	40	60	1
		Total	**17**	**1**	**8**	**26**	**400**	**600**	**21**

****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(AI) 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	M24ES408EC	Logic Design and Computer Architecture	3	1	0	4	40	60	4
2	M24PC405AI	Software Engineering	3	0	0	3	40	60	3
3	M24PC406AI	Design and Analysis of Algorithms	3	0	0	3	40	60	3
4	M24PC407AI	Data Science	3	0	0	3	40	60	3
5	M24HS402HS	Human Values & Professional Ethics	2	0	0	2	40	60	2
6	M24PC408AI	MOOCS	0	0	0	0	0	0	3
Practical / Laboratory Courses									
7	M24PC454AI	Data Science Lab	0	0	2	2	40	60	1
8	M24PC455AI	Java Programming Lab	0	0	2*2	4	40	60	2
9	M24PW456AI	Mini Project I - App Development – Android/ Flutter/ Flask	0	0	2	2	40	60	1
		Total	**14**	**1**	**6**	**23**	**320**	**480**	**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

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. – CSE (Artificial Intelligence)

CSE(AI) 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	M24PC301AI	Discrete Structures	45	15	0	30	90	40	60	3
3	M24PC302AI	Operating Systems	45	15	0	30	90	40	60	3
4	M24PC303AI	Database Management Systems	45	15	0	30	90	40	60	3
5	M24PC304AI	Statistical Analytics and Computing using Python Programming	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	M24PC351AI	Operating Systems Lab	0	0	30	0	30	40	60	1
8	M24PC352AI	Database Management Systems Lab	0	0	30	0	30	40	60	1
9	M24PC353AI	Statistical Analytics and Computing using Python Programming Lab	0	0	30	0	0	40	60	1
10	M24SE351AI	Skill Enhancement Course - IOT	0	0	30	0	0	40	60	1
		Total	**255**	**75**	**120**	**180**	**570**	**400**	**600**	**21**

****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(AI) 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	M24ES408EC	Logic Design and Computer Architecture	60	15	0	45	120	40	60	4
2	M24PC405AI	Software Engineering	45	15	0	30	90	40	60	3
3	M24PC406AI	Design and Analysis of Algorithms	45	15	0	30	90	40	60	3
4	M24PC407AI	Data Science	45	15	0	30	90	40	60	3
5	M24HS402HS	Human Values & Professional Ethics	30	0	0	30	60	40	60	2
6	M24PC408AI	MOOCS	0	0	0	90	90	0	0	3
Practical / Laboratory Courses										
7	M24PC454AI	Data Science Lab	0	0	30	0	0	40	60	1
8	M24PC455AI	Java Programming Lab	0	0	60	0	60	40	60	2
9	M24PW456AI	Mini Project I - App Development – Android/ Flutter/ Flask	0	0	30	0	30	40	60	1
		Total	**225**	**60**	**120**	**255**	**630**	**320**	**480**	**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. - CSE (ARTIFICIAL INTELLIGENCE)

CSE(AI) 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	M24PC301AI	Discrete Structures	3	0	0	3	40	60	3
3	M24PC302AI	Operating Systems	3	0	0	3	40	60	3
4	M24PC303AI	Database Management Systems	3	0	0	3	40	60	3
5	M24PC304AI	Statistical Analytics and Computing using Python Programming	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	M24PC351AI	Operating Systems Lab	0	0	2	2	40	60	1
8	M24PC352AI	Database Management Systems Lab	0	0	2	2	40	60	1
9	M24PC353AI	Statistical Analytics and Computing using Python Programming Lab	0	0	2	2	40	60	1
10	M24SE351AI	Skill Enhancement Course - IOT	0	0	2	2	40	60	1
		Total	**17**	**1**	**8**	**26**	**400**	**600**	**21**

****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

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(AI) 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	M24PC301AI	Discrete Structures	45	15	0	30	90	40	60	3
3	M24PC302AI	Operating Systems	45	15	0	30	90	40	60	3
4	M24PC303AI	Database Management Systems	45	15	0	30	90	40	60	3
5	M24PC304AI	Statistical Analytics and Computing using Python Programming	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	M24PC351AI	Operating Systems Lab	0	0	30	0	30	40	60	1
8	M24PC352AI	Database Management Systems Lab	0	0	30	0	30	40	60	1
9	M24PC353AI	Statistical Analytics and Computing using Python Programming Lab	0	0	30	0	0	40	60	1
10	M24SE351AI	Skill Enhancement Course - IOT	0	0	30	0	0	40	60	1
		Total	**255**	**75**	**120**	**180**	**570**	**400**	**600**	**21**

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 this course is to make the student

1. To study the concepts of Probability and random variables
2. To provide the knowledge of discrete probability Distributions
3. To learn theoretical continuous probability distributions.
4. To provide the knowledge of correlation and regression.
5. To 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** 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. Fundamentals of Mathematical Statistics, S.Chand Pub.
2. R.K.Jain and Iyengar, Advance Engineering Mathematics, 5th Edition, Narosa Publications
3. P.Sivaramakrishna Das & C. Vijaya Kumar,Engineering Mathematics, Pearson India Education Services Pvt.Ltd, 2017

Reference Books:

1. Dr.B.S.Grewal, Higher. Engineering Mathematics, Khanna Publications, 43rd Edition,2014.
2. P.G Hoel, S.C Port and C.J Stone, Introduction to Probability Theory, Universal Book Stall, 2003
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley,2012
4. W. Feller,An Introduction to Probability Theory and its Applications, Vol. 1, Wiley, 1968.
5. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC301AI	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 this course is to make the student

1. To understand the concepts of Logic, Rules of inference and Quantifiers
2. To explain with examples, the basic terminology of functions, relations, and sets.
3. To understand the basic concept of combinatorics.
4. To relate the ideas of mathematical induction to recursion and recursively defined structures.
5. To 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, Truth 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, Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Hasse Diagram.

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

UNIT-III

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

UNIT-IV

Recurrence Relations: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, 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. Kenneth H. Rosen, Discrete Mathematics and its Applications, 5th Edition, McGraw Hill Education, 2017.
2. C L Liu, D PMohapatra,Elements of Discrete Mathematics- A Computer Oriented Approach-3rd Edition, Tata McGrawHill, 2017.
3. J.L. Mott, A. Kandel, T.P Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, PHI, 2015.

Reference Books:

1. Malik & Sen, Discrete Mathematical Structures Theory and Application- 1st Edition, Cengage Learning, 2012.
2. Thomas Koshy, Discrete Mathematics with Applications, 1st Edition, Elsevier, 2005.
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC302AI	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 this course is to make the student

1. To provide a comprehensive understanding of the fundamental principles, functions, and services of operating systems in managing hardware and software resources.
2. To enable students to learn various concepts of process management, thread handling, synchronization techniques, and inter-process communication.
3. To impart knowledge on memory management strategies, virtual memory concepts, and page replacement policies to optimize system performance.
4. To develop an understanding of file systems, I/O device management, and storage techniques for efficient data handling and system operations.
5. To 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 State transitions, 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. Abraham Silberschatz, Peter B Galvin, Greg Gagne, Operating System Concepts Essentials, 9 th Edition, Wiley Asia Student Edition, 2017.
2. William Stallings, Operating Systems: Internals and Design Principles, 5th Edition, Prentice Hall of India, 2016.
3. Andrew S. Tanenbaum Modern Operating Systems, (2007),2nd edition, Prentice Hall of India, India

Reference Books:

1. Maurice Bach, Design of the Unix Operating Systems, 8th Edition, Prentice-Hall of India, 2009.
2. Daniel P. Bovet, Marco Cesati, Understanding the Linux Kernel,3rd Edition, O'Reilly and Associates.
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC303AI	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 this course is to make the student

1. To get familiar with fundamental concepts of database management which includes database design, database languages, and database-system implementation.
2. To get familiar with data storage techniques and indexing.
3. To impart knowledge in transaction Management, concurrency control techniques and recovery techniques.
4. To master the basics of SQL and construct queries using SQL.
5. To 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. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems, 3rd Edition, TATA McGraw Hill.
2. Silberschatz, Korth, Data base System Concepts, 5th Edition, McGraw Hill.
3. C.J.Date , Introduction to Database Systems, 8th Edition, Pearson Education.
4. Rob & Coronel, Database Systems design, Implementation, and Management, 9th Edition, Cengage Learning, Inc

Reference Books:

1. Elmasri Navate, Fundamentals of Database System, 7th Edition, Pearson Education.
2. Mathew Leon, Leo, Database Management System, 1st Edition, Tata McGraw Hill Education
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC304AI	STATISTICAL ANALYTICS AND COMPUTING USING PYTHON PROGRAMMING						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Programming for Problem Solving using C	45	15	0	30	40	60	3

Course Objectives:

The objective of this course is to make the student

1. To introduce students to the Python programming environment and familiarize them with its syntax, semantics, and core programming constructs.
2. To develop the ability to write Python programs using conditional, looping, and function constructs for solving real-time computational problems.
3. To expose students to different Python data structures such as strings, lists, dictionaries, sets, and tuples with emphasis on their applications.
4. To train students in using external libraries such as NumPy and Pandas for data manipulation, statistical analysis, and basic visualization.
5. To prepare students to build modular, efficient Python programs that include file handling, exception management, and data analysis capabilities

Course Outcomes:

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

CO1. **Recall and interpret** the basic concepts of Python programming, including syntax, variables, data types, and standard libraries.

CO2. **Apply** control structures, functions, file operations, and data structures like lists, strings, tuples, sets, and dictionaries to solve basic computational problems.

CO3. **Analyze** complex problems using modular and structured programming approaches, handling exceptions and manipulating structured data.

CO4. **Evaluate** data using built-in functions, sorting/searching algorithms, and summarize data using NumPy and Pandas libraries.

CO5. **Design and develop** Python-based solutions for simple data analysis tasks using appropriate libraries and visualization 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				3				1		1	3	3	
CO2	3	1	2	1	3				3		2	3	3	
CO3	3	2			3				1		2	3	3	
CO4	3	1	3	2	3				3		1	3	3	
CO5	3	2	3	3	3				2		3	3	3	

UNIT-I

Introduction to Python Programming: Python Interpreter, Parts of Python Language: Identifiers, Keywords, Statements, Variables and Operators, Data Types, Indentation, Comments, Type conversions, type() Function and is Operator, Dynamic and strong Typed language, Command line arguments.

Control Flow Statements: if, if.else, if…elif…else Decision Control Statements, Nested if Statement, the while Loop, the for Loop, the continue and break Statements. Exception Handling.

UNIT-II

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List operations, Indexing and slicing in Lists, Built in Function used in List, List Methods, Advanced List processing - list comprehension. Illustrative programs: selection sort, insertion sort, merge sort.

UNIT-III

Dictionaries: Creating Dictionaries, Accessing and Modifying, Built-in Functions used in Dictionaries, Dictionary Methods.

Tuples and Sets: Creating tuples, Basic tuple operations, Indexing and slicing, Built-in Functions used in tuples, tuple methods, Sets: Creating sets, Basic set operations, set methods.

Files and Modules: Types of Files, Creating, reading, and writing files, File Methods. Modules and packages: Built-in Modules, creation of user defined modules, Pickle Module, Illustrative programs: word count, copy file, reading and writing CSV files.

UNIT-IV

NumPy: Understanding NumPy arrays, NumPy Arrays creation using array() function, Array attributes, Arrays creation with initial placeholder content, Indexing, Basic Arithmetic operations on NumPy Arrays, Mathematical Functions in NumPy, manipulating array shapes, Stacking and Splitting of NumPy Arrays, Broadcasting arrays.

UNIT-V

Pandas: Creating pandas Data Frames, understanding pandas Series, Reading, and querying the Quandl data, describing pandas Data Frames, Grouping, and joining pandas Data Frame, working with missing values, creating pivot tables. Overview of Python for Data Science.

Text Books:

1. Gowrishankar S., Veena A Introduction to Python Programming,CRC Press, Taylor & Francis Group, 2019.
2. Richard L. Halterman, Learning to Program with Python, Copyright © 2011.
3. B. L. S. Prakasa Rao,A First Course in Probability and Statistics, World Scientific/ Cambridge University Press India, 2009.

Reference Books:

1. R. V. Hogg, J. W. McKean and A. Craig, Introduction to Mathematical Statistics, 6th Edition, Pearson Education India, 2006.
2. R,Gareth M. James, Introduction to statistical learning: With applications, Springer2013
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 this course is to make the student to

1. To reinforce the students understanding with the pan-Indian heritage in terms of culture, traditions and knowledge.
2. To impart understanding of the importance of the various Indian Languages and Literature.
3. To impart basic knowledge of Indian religion and Philosophies.
4. To impart basic knowledge on Indian Paintings, Dance and Drama, Handicrafts and Indian Architecture.
5. To 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. Kapil Kapoor and Avadhesh Kumar Singh, Indian Knowledge Systems (2 Vols-Set), ISBN 10: 8124603367 / ISBN 13: 9788124603369, Published by D K Print world, Publication Date: 2007
2. Samskrita Bharati, Science in Samskrit, Published by Samskrita Bharati, New Delhi, India, 2007; ISBN 10: 8187276339 / ISBN 13: 9788187276333.
3. Basanta Kumar Mohanta and Vipin K. Singh,Traditional Knowledge System and Technology in India, originally published: 2012 Publication Date: 2012; ISBN 10: 8177023101 ISBN 13: 9788177023107.
4. Position paper, National Focus Group on Arts, Music, Dance and Theatre NCERT, March 2006, ISBN 81-7450-494-X, NCERT, New Delhi, 2010.
5. B.N Luniya, Evolution of Indian Culture – (Text Book), Ina Publishers,2010

Reference Books:

1. Nitin Singhania, Indian Art and Culture, 4th Edition, ISBN: 9354601804 · 9789354601804, © 2022 | Published: December 20, 2021
2. S. Narain, Education and Examination Systems in Ancient India, written/authored/edited published 2017, English-Hardcover, ISBN 9789351282518 publisher: Kalpaz Publications.
3. Founders of Sciences in Ancient India, Satya Prakash, Vijay Kumar Publisher, New Delhi, 1989
4. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, New Delhi, 2005
5. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC351AI	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 this course is to make the student

1. To Learn various system calls in Linux
2. To Learn different types of CPU scheduling algorithms.
3. To Demonstrate the usage of semaphores for solving synchronization problem
4. To Understand memory management techniques and different types of fragmentation.
5. To 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 and 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, 3 rd ed., Boston, MA, USA: Addison-Wesley, 2013.
2. Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, Operating System Concepts, 10 th 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
M24PC352AI	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 this course is to make the student

1. To practice various DDL, DML commands in SQL
2. To write simple and Complex queries in SQL
3. To practice various Functions, Joins &sub queries in SQL
4. To write PL/SQLusing cursors and collections
5. To 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,

Course Code	Course Title						Core / Elective
M24PC353AI	STATISTICAL ANALYTICS AND COMPUTING USING PYTHON PROGRAMMING LAB						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Programming for Problem Solving using C Lab	0	0	30	0	40	60	1

Course Objectives:

The objective of this course is to make the student

1. To introduce the fundamentals of Python programming and data types.
2. To enable students to implement control structures, functions, recursion, and string operations.
3. To facilitate learning of core data structures like lists, dictionaries, and sets in Python.
4. To develop the ability to read/write from files and manipulate data using libraries like NumPy and Pandas.
5. To equip students with skills for data analysis and visualization using Python.

Course Outcomes:

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

CO1. **Apply** basic Python programming concepts like variables, operators, and control structures to solve simple computational problems.

CO2. **Analyze** problems involving strings, recursion, and modularity using functions to write structured Python code.

CO3. **Implement and evaluate** programs using Python's built-in data structures like lists, dictionaries, and sets for solving data-centric problems.

CO4. **Create** and manipulate data using NumPy and Pandas for statistical computation and visualization.

CO5. **Interpret** data from various sources (files, CSVs) and visualize using Python libraries like matplotlib to derive meaningful insights.

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	2	
CO2	3	2			2							1	3	2
CO3	3	3	2		3							1	3	3
CO4	3	2	2		3							1	3	3
CO5	3	2	3		3							1	3	3

List of Programs:

1. Write a program to declare variables and assign different types of data to those variables and
2. display the data types of those variables.
3. Write a program to perform different Arithmetic operations on numbers in Python
4. Write a program to find the area of a triangle whose sides are read by command line arguments.
5. Write a program to convert the temperature in degree centigrade to Fahrenheit.
6. Write a program to find the circumference and area of a circle with a given radius.
7. Write a program to check whether the given number is prime or not.
8. Write a program to check leap year.
9. Write a program to find the average of 10 numbers using while loop.
10. Write a program to display the given integer in a reverse manner.
11. Write a program to find the sum of the digits of an integer using a while loop.
12. Write a program to display all integers within the range 100-200 whose sum of digits is an even number.
13. Write a program to find the roots of a quadratic equation and display the nature of roots.
14. Write a program to find the factorial of a number using recursion.
15. Write a program to find the Nth term in a Fibonacci series using recursion.
16. Write a program to create, concatenate and print a string and access sub-string from a given string.
17. Write a program to check whether a string is palindrome or not.
18. Write a program to create a list and display the sum of list members.
19. Write a program to implement linear and binary search.
20. Write a program to find the largest number in a list without using built-in function.
21. Write a program to create a dictionary and print all the items in a dictionary.
22. Write a Program to create two sets and display union, intersection, difference, and symmetric difference of the two sets.
23. Write a python program to define a module and import a specific function in that module to another program.
24. Write a program to implement a calculator to do basic operations using functions
25. Write a program that inputs a text file and prints all the unique words in the file in alphabetical order.
26. Write a program named copyfile.py. This file should prompt the user for the names of two text files. The contents of the first file should be copied
27. Write a python program to a NumPy array and calculate the mean value, standard deviation, or maximum/minimum.
28. Write a python program to create two dimensional arrays using NumPy and perform matrix multiplication.
29. Create a DataFrame with pandas and display it.
30. Load a CSV file into a Pandas DataFrame and display a line plot, a bar plot, a histogram, box plot.

List of Additional Programs

1. Write a Python program to count the frequency of each unique element in a given tuple using a dictionary.
2. Write a Python program to generate 20 random integers using NumPy and display their mean, median, standard deviation, and variance.

Text Books:
1. Gowrishankar S., Veena A, Introduction to Python Programming, CRC Press, Taylor & Francis Group, 2019.
2. Richard L. Halterman, Learning to Program with Python, Copyright © 2011.
3. B. L. S. Prakasa Rao, A First Course in Probability and Statistics, World Scientific/ Cambridge University Press India, 2009.

SKILL ENHANCENMENT 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
M24SE351AI	SKILL ENHANCENMENT 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 this course is to make the student 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

IV SEMESTER SYLLABUS

Scheme of Instruction & Examination
B. E. - CSE (ARTIFICIAL INTELLIGENCE)

CSE(AI) 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	M24ES408EC	Logic Design and Computer Architecture	3	1	0	4	40	60	4
2	M24PC405AI	Software Engineering	3	0	0	3	40	60	3
3	M24PC406AI	Design and Analysis of Algorithms	3	0	0	3	40	60	3
4	M24PC407AI	Data Science	3	0	0	3	40	60	3
5	M24HS402HS	Human Values & Professional Ethics	2	0	0	2	40	60	2
6	M24PC408AI	MOOCS	0	0	0	0	0	0	3
Practical / Laboratory Courses									
7	M24PC454AI	Data Science Lab	0	0	2	2	40	60	1
8	M24PC455AI	Java Programming Lab	0	0	2*2	4	40	60	2
9	M24PW456AI	Mini Project I - App Development – Android/ Flutter/ Flask	0	0	2	2	40	60	1
Total			**14**	**1**	**6**	**23**	**320**	**480**	**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

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(AI) 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	M24ES408EC	Logic Design and Computer Architecture	60	15	0	45	120	40	60	4
2	M24PC405AI	Software Engineering	45	15	0	30	90	40	60	3
3	M24PC406AI	Design and Analysis of Algorithms	45	15	0	30	90	40	60	3
4	M24PC407AI	Data Science	45	15	0	30	90	40	60	3
5	M24HS402HS	Human Values & Professional Ethics	30	0	0	30	60	40	60	2
6	M24PC408AI	MOOCS	0	0	0	90	90	0	0	3
Practical / Laboratory Courses										
7	M24PC454AI	Data Science Lab	0	0	30	0	0	40	60	1
8	M24PC455AI	Java Programming Lab	0	0	60	0	60	40	60	2
9	M24PW456AI	Mini Project I - App Development – Android/ Flutter/ Flask	0	0	30	0	30	40	60	1
Total			**225**	**60**	**120**	**255**	**630**	**320**	**480**	**22**

Course Code	Course Title						Core / Elective
M24ES408EC	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 this course is to make the student

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

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-III

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-IV

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. Morris Mano, Digital Design, 4th Edition, Pearson Education, Inc, 2002
2. M. Morris Mano, Computer system architecture, 3rd Edition, Prentice-Hall, Inc., 1993.
3. Bhurchandi, Kishor M, Advanced Microprocessors and Peripherals,3rd Edition, Tata McGraw Hill India, 2006.

Reference Books:

1. William Stallings, Computer organization and architecture: designing for performance, 8th Edition, Pearson Education India, 2016.
2. Sunil, 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
M24PC405AI	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 this course is to make the student

1. To understand the fundamental concepts, principles, and practices of software engineering.
2. To learn various software development process models and project planning techniques.
3. To develop skills in system modelling using UML diagrams and Data Flow Diagrams (DFDs).
4. To gain knowledge of software implementation, testing strategies, and maintenance activities.
5. To 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. Roger S. Pressman, Software Engineering: A Practitioner's Approach, 7th Edition, McGraw Hill, 2009
2. Ian Sommerville, Software Engineering, 7th edition, Addison-Wesley, 2004.
3. Rajib Mall, Fundamentals of Software Engineering,5th Edition, PHI, 2009.

Reference Books:

1. Ali Behforooz and Frederick J. Hudson, Software Engineering Fundamentals, Oxford University Press, 1996
2. Pankaj Jalote, An Integrated Approach to Software Engineering,3rd Edition, Narosa Publishing House, 2000
3. James F. Peters, Witold Pedrycz, ,Software Engineering, an Engineering approach,7th Edition, John Wiley.
4. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC406AI	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 this course is to make the student

1. To provide an understanding of AI fundamentals, including problem-solving, search algorithms and game-playing techniques.
2. To teach knowledge representation methods and uncertainty handling techniques.
3. To introduce planning techniques such as hierarchical task network, constraint satisfaction and Markov decision process.
4. To provide an understanding of machine learning techniques for solving real-world problems.
5. To 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. Horowitz E, Sahni S, Fundamentals of Computer Algorithms, 2nd Edition, Universities Press, 2007.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, 3rd Edition, PHI Learning Private Limited, 2012.

Reference Books:
1. Michael T. Goodrich, Roberto Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, 1st Edition, John Wiley & Sons,2002
2. Aho, Ullman and Hopcroft, Design and Analysis of algorithms, 2nd Edition, Pearson education.
3. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC407AI	DATA SCIENCE						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Statistical Analytics and Computing using Python Programming	45	15	0	30	40	60	3

Course Objectives:

The objective of this course is to make the student

1. Introduce Python and essential libraries used in data science.
2. Enable students to perform data cleaning, transformation, and visualization.
3. Teach core statistical techniques like descriptive and inferential statistics.
4. Develop understanding of machine learning models for classification and clustering.
5. Expose students to applications of data science in network and graph analysis.

Course Outcomes:

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

CO1. **Demonstrate** the fundamental concepts, tools, and processes in data science using Python.

CO2. **Apply** Python libraries to manipulate, visualize, and analyze data.

CO3. **Analyze** statistical data, models, and clustering to interpret data patterns.

CO4. **Evaluate** data hypotheses and models using statistical inference and metrics.

CO5. **Create** data science applications using Python for real-world problem-solving.

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						1	3	3	
CO2	3	3			3						3	3	3	3
CO3	3	3	3		3						2	3	3	3
CO4	3	3	1	3	3						3	3	3	3
CO5	3	3	3	3	3	3		3	3	3	3	3	3	3

UNIT-I

Introduction, Toolboxes: Python, fundamental libraries for data Scientists. Integrated development environment (IDE). Data operations: Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting.

UNIT-II

Descriptive statistics, data preparation: Exploratory Data Analysis data summarization, data distribution, measuring asymmetry. Sample and estimated mean, variance and standard score. Statistical Inference frequency approach, variability of estimates, hypothesis testing using confidence intervals, using pvalues

UNIT-III

Supervised Learning: First step, learning curves, training-validation and test. Learning models generalities, support vector machines, random forest. Examples

UNIT-IV

Regression analysis: linear regression simple linear regression, multiple & Polynomial regression, Sparse model. Unsupervised learning, clustering, similarity and distances, quality measures of clustering, case study.

UNIT-V

Network Analysis: Graphs, Social Networks, centrality, drawing centrality of Graphs, PageRank, Ego-Networks, community Detection

Text Books:

1. Igual, L;Seghi, ,Introduction to Data Science a Python approach to concepts, Techniques and Applications, Springer, ISBN:978-3-319-50016-4 2.
2. David Taieb, Data Analysis with Python A Modern Approach, Packt Publishing, ISBN-9781789950069

Reference Books:

1. Armando Fandango, Python Data Analysis, 2nd Edition, Packt Publishing, ISBN: 9781787127487
2. 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 this course is to make the student

1. To create an awareness on Human Values and Engineering Ethics.
2. To move from discrimination to commitment.
3. To understand social responsibility of an engineer.
4. To appreciate ethical dilemma while discharging duties in professional life.
5. To 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. Gaur R.R, Sangal R, Bagaria G.P, A Foundation Course in value Education, Excel Books,2009
2. A.N Tripathy, Human Values, New Age International Publishers, 2003.
3. Bajpai. B. L.,Indian Ethos and Modern Management, New Royal Book Co., Lucknow, Reprinted, 2004
4. Bertrand Russell, Human Society in Ethics & Politics, Taylor and Francis, 2007

Reference Books:

1. Corliss Lamont, Philosophy of Humanism, Humanist Press**,** 1997
2. Books, Gaur. R.R., Sangal. R, Bagaria. G.P, Teachers Manual Excel, 2009.
3. J. Adler, Whatman has made of man, Mortimer. Hardcover,2007.
4. https://ekumbh.aicte-india.org/book.php

Course Code	Course Title						Core / Elective
M24PC454AI	DATA SCIENCE LAB						PC
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Statistical Analytics and Computing using Python Programming	0	0	30	0	40	60	1

Course Objectives:

The objective of this course is to make the student

1. To familiarize students with Python programming and IDEs for data handling and manipulation.
2. To implement basic algorithms and data visualization techniques using Python.
3. To develop programs for statistical analysis and exploratory data analytics.
4. To train students in applying classification and clustering methods on datasets.
5. To provide hands-on experience in graph analytics and network-based data science applications.

Course Outcomes:

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

CO1. **Demonstrate** the use of Python interactive commands, file handling, and data operations.
CO2. **Apply** Python to implement searching, sorting, and data visualization techniques.
CO3. **Analyze** datasets using statistical tools such as standard deviation, variance, and data distributions
CO4. **Develop** programs for machine learning models like SVM and k-means for data classification and clustering.
CO5. **Evaluate** social networks using graph analytics such as community detection, centrality, and PageRank.

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			3								3	
CO3	3	3			3								3	
CO4	3	3	3		3							3	3	
CO5	3	3	3		3							3	3	

List of Programs:

1. Interactive commands in Python, data operations, file read/write and manipulations

2. Familiarization with IDE in Python
3. Writing programs for standard algorithms of sorting and searching in Python
4. Plotting the data using X-Y graph, Bar chart, and other plotting techniques
5. Perform exploratory data analysis: variance, std. deviation, summarization, distribution, inference
6. Plotting the various distributions for given data sets
7. Classifying and presentation of data using Support Vector Machine
8. Write programs for K-means clustering and presentation for given data sets
9. Write programs on graphs of social networks for community detection
10. Write programs for analysis of graphs to find centrality and PageRank

List of Additional Programs

1. Work with any data set for data loading and data cleaning operations.
2. Perform EDA on any data set.

Text Books:

1. W Armando Fandango, Python Data Analysis, 2nd Edition, Packt Publishing, ISBN: 9781787127487

Course Code	Course Title						Core / Elective
M24PC455AI	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 this course is to make the student

1. To implement various java concepts.
2. To write java programs to solve mathematics, science and engineering problems.
3. To identify compile time and runtime errors, syntax and logical errors
4. To import the essentials of java class library and user defined packages.
5. To 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

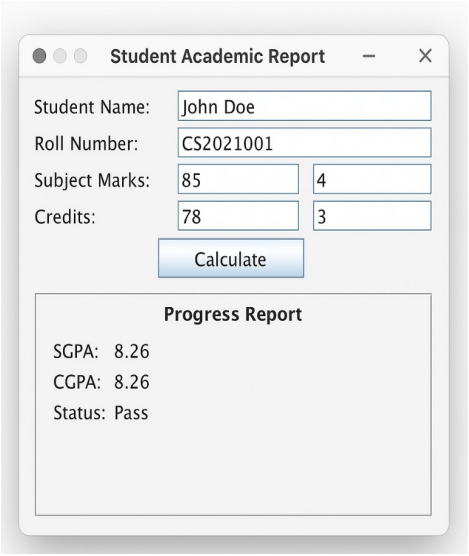
CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

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 a 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 serve

Text Books:

1. Herbert Schieldt, Dr.Danny Coward, Java: The Complete Reference, 13th Edition, Mc Graw Hill Education
2. Sachin Malhotra, Saurabh Choudhary, Programming in Java, 2nd Edition, Oxford University Press

Course Code	Course Title						Core / Elective
M24PW456AI	MINI PROJECT I - APP DEVELOPMENT – ANDROID/ FLUTTER/ FLASK						PW
Prerequisite	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
	0	0	30	0	40	60	1

Guidelines for Mini Project

1. The mini project is a team activity with a maximum of 3 students in a team. This is software-based design work.
2. The mini project may be a combination of hardware and software
3. Mini Project should cater to a small system required in laboratory or real life.
4. After interactions with course coordinator and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of mini project.
   a. Students are expected to detail specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within the first week of the semester.
   b. The student is expected to exert on design, development and testing of the proposed work as per the schedule.
   c. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.
5. The Mini Project will be evaluated for total of 100 marks where 40 marks are from CIE and 60 marks from SEE