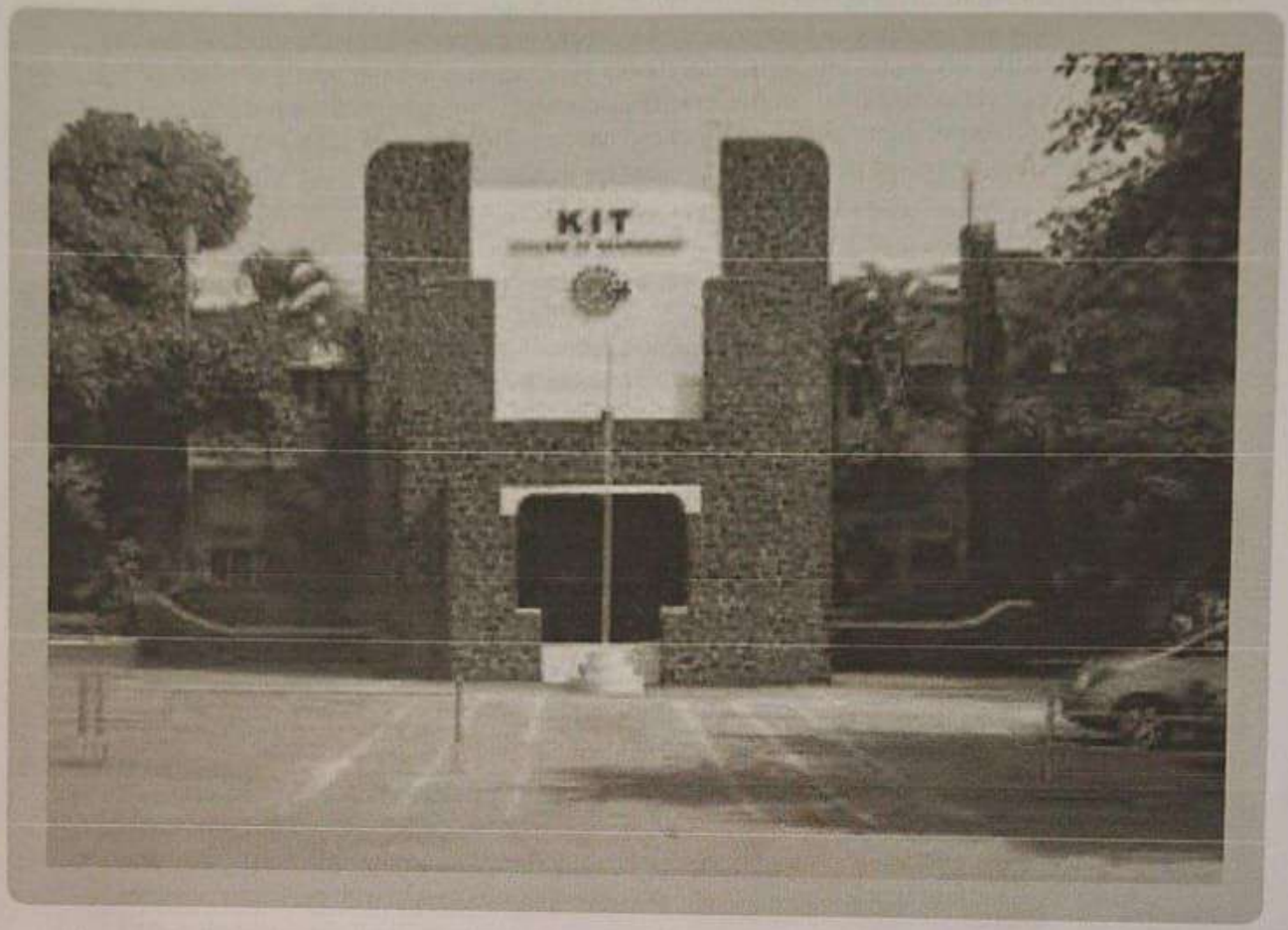
Kolhapur Institute of Technology's College of Engineering (Autonomous), Kolhapur



Department of Computer Science and Engineering (AIML)

Curriculum and Syllabus

for

B. Tech. Computer Science and Engineering (AIML)

Scheme: 2024-25 (As Per NEP)

Dr. Uma P. Gurav
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Department of CSE (AIML & DS)
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College of Engineering (Autonomous),
Kolhapur

SEMESTER III

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs/ Week	Credits	Evaluation Scheme (Components)			
1	PC	UAMPC0301	Linear Algebra	3	1	-	4	4	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2	PC	UAMPC0302	Discrete Mathematics and Graph Theory	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3	PC	UAMPC0303	Advanced Data Structures	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4	PC	UAMPC0304	Database Management System	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5	VEC	UAMVE0305	Constitution of India	2	-	-	2	2	ISE	50	20	20
6	HSSM	UAMEM0306	Principles of AIML	2	-	-	2	2	ESE	50	20	20
7	PC	UAMPC0331	Advanced Data Structures Laboratory	-	-	2	2	1	ISE ESE (POE)	25 50	10 20	
8	PC	UAMPC0332	Database Management System Laboratory			2	2	1	ISE ESE (POE)	25 25	10 10	
9	PC	UAMPC0333	Software System Tools Laboratory			2	2	1	ISE	25	10	
10	OJT	UAMIL0371	Mini Project-I			2	2	1	ISE	50	20	
11	MM	UAMMM03**	MM-1	2			2	2	ESE	100	40	
						Total:	**27**	**23**	**Total Marks: 800** **Total Credit: 23**			

Course Code:	UAMPC0301	L	T	P	Credit
Course Name:	Linear Algebra	3			3

Course Prerequsites:

Basics of Matrix Algebra, Vectors and Set Theory

Course Description:

TThis linear algebra course covers matrices, vector spaces, eigenvalue problems, linear transformations, and matrix decompositions, with applications in data analysis and statistical techniques.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Demonstrate the basic mathematical concepts in AI and data science related to linear algebra and statistics.	L2	Understand
CO2	Explain vector space concepts and orthogonality in solving problems in AI and data science.	L3	Understand
CO3	Apply the knowledge of linear transformations, matrix decompositions, and statistical techniques to solve problems in AI and data science	L4	Apply
CO4	Analyze structured data using exploratory data analysis and regression techniques for informed decision-making	L3	Analysis

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Matrices	8 Hours

Matrices and Computation of Eigen value by power method, Iterative Method for AX = B : Gauss Jacobi , Gauss-Siedel Method, LU Decomposition, Computation with Matrices - Matrix Norms, Condition Numbers , Inner and outer products,

UNIT 2	Vector Algebra	8 Hours

Vector Spaces, Subspaces, Span, Linear Independence, Basis and Dimension, Orthogonality - Orthogonal Vectors and Subspaces, Cosines and Projections onto Lines ,Orthogonal Bases and Gram – Schmidt

UNIT 3	Linear Algebra-I	8 Hours

Eigen value Problems: Diagonalization of a Matrix ,Powers , Differential Equations , Positive Definite Matrices - Minima,Maxima , Saddle Points, Tests for Positive Definiteness , Singular value decomposition.

UNIT 4	Linear Algebra-II	7 Hours

Linear Transformations Definition and example of linear transformation, Null space, range, rank and nullity of linear transformation, Matrix representation of a linear transformation, Composition of linear transformation, Transformation Diagonalization : Diagonalizability		
UNIT 5	**Exploratory Data Analysis**	**7 Hours**
Elements of Structured Data, Rectangular Data, Mean , Median, Mode, Standard Deviation, Percentiles and Boxplots Expected Value.		
UNIT 6	**Statistical Techniques for data analysis**	**7 Hours**
Correlation and Coefficient of correlation. Linear Regression, Fitting of curves by method of least-squares, Fitting of Straight lines , Fitting of Parabolic Curves. Fitting of Exponential curves.		
Text Books:		
1. Linear Algebra and Its Applications - by Gilbert Strang, 4th Edition, Thomson Brooks/Cole 2. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4th Ed., PrenticeHall of India Pvt. Ltd., New Delhi, 2004.		
Reference Books:		
1.Numerical Linear Algebra, Allaire, Grégoire, Kaber, Sidi Mahmoud, Springer (2008) 2. Applied Numerical Linear Algebra, by James W. Demmel, SIAM (1997) 3. Numerical Linear Algebra, by Lloyd Trefethen and David Bau III, SIAM, 1997. [Lectures 1-29, 32- covered in chapter 1-6 of the Text Book] 4. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.		
Web Resources:		
1.1. Mathematics – NOC: Linear Algebra (IIT Madras) https://onlinecourses.nptel.ac.in/noc22_ee12 2.Basic Linear Algebra – Prof I. K. Rana (IIT Bombay) https://onlinecourses.nptel.ac.in/noc24_ma13/		

Course Code:	UAMPC0302	L	T	P	Credit
Course Name:	Discrete Mathematics & Graph Theory	3			3

Course Prerequsites:

Basic Mathematics

Course Description:

This course focuses on concepts of Discrete Mathematical Structures such as Set Theory & Relations, Mathematical Logic, Algebraic systems, Lattices, Graphs, Counting Theory Principles etc. These topics form the basis of modern mathematics and have applications in computer science, engineering, and cryptography, and operations research. Through the study of discrete structures and their applications, students will develop critical thinking, problem-solving skills, and logical reasoning abilities.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Understand and work with the discrete mathematical structures such as Sets, Algebraic systems, Groups, Probability in the field of Computer Science.	L2	Understand
CO2	Gain proficiency in algorithmic thinking to illustrate the problems related to the topics in discrete mathematics in Computer Science.	L2	Understand
CO3	Apply combinatorial techniques including permutations, combinations, and counting principles to solve computational problems.	L3	Apply
CO4	Analyze and apply graph theory concepts such as trees, traversals, graph coloring, and network optimization to real-world scenarios.	L4	Analyze

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1 Mathematical logic — **9 Hours**

Statements and Notations, Connectives – negation, Conjunction, disjunction, conditional, bi-conditional, Statement formulas and truth tables, Well-formed formulas, Tautologies,Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives, Normal and principal normal forms, completely parenthesized infix and polish notations, Theory of Inference for statement calculus –validity using truth table, rules of inference, consistency of Premises and indirect method of proof.

UNIT 2 Set Theory — **9 Hours**

Basic concepts of set theory, Operations on sets, Ordered pairs, Cartesian Products, Representation of discrete structures, Relation and ordering - properties of binary relations in a set, Relation matrix and the graph of a relation, Partition and Covering of set, Equivalence relations, Composition of Binary relations, Partial ordering , POSET and Hasse diagram. Functions – types, composition of functions, Inverse functions.

UNIT 3 Algebraic systems — **6 Hours**

Algebraic systems, properties and examples ,Semigroups and Monoids, properties and examples, Homomorphism of Semigroups and Monoids , Groups: Definition and examples, Subgroups and homomorphism.

UNIT 4	**Lattices and Boolean algebra**	**6 Hours**
Lattice as POSETs , definition , examples and properties ,Lattice as algebraic systems, Special lattices, Boolean algebra definition and examples, Boolean functions.		
UNIT 5	**Permutations, Combinations**	**6 Hours**
The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Generalized Permutations and Combinations.		
UNIT 6	**Graph Theory**	**9 Hours**
Basic concepts of Graph Theory, Storage Representation and Manipulation of Graphs, Eulerian and Hamiltonian Graphs, Graph Colouring-chromatic, Trees-Definitions, Examples and Properties, PERT & Related Technologies.		
Text Books:		
1. Discrete Mathematical Structures with Application to Computer Science- J. P. Tremblay & R. Manohar (MGH International). 2. Discrete Mathematics and its Applications- Kenneth H. Rosen (AT & T Bell Labs)		
Reference Books:		
1. Discrete Mathematics- Semyour Lipschutz, MarcLipson (MGH)- Schaum's Outlines 2. C.L. Liu and D. Mohapatra, "Elements of Discrete Mathematics"- SiE Edition, TMGH,2008,ISBN10:07-066913-9		
Web Resources:		
1. https://onlinecourses.nptel.ac.in/noc20_cs82/preview 2. https://www.coursera.org/courses?query=discrete%20mathematics 3. https://mathily.org/dm-rw.html		

Course Code:	UAMPC0303	L	T	P	Credit
Course Name:	Advanced Data Structures	3			3

Course Prerequsites:

C Programming, Basics of Data Structure

Course Description:

This course covers introduction to Linear Data structure, Linked List and its applications. It explains non-Linear data structures Viz. Tress and Graphs in depth. This course also covers sorting techniques and Hashing

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Explain various linear and non-linear data structures such as arrays, stacks, queues, linked lists, trees, and graphs, and their roles in solving computational problems.	L2	Explain
CO2	Apply appropriate linear and non-linear data structures for solving problems.	L3	Apply
CO3	Analyze the performance and efficiency of algorithms using time and space complexity	L4	Analyze
CO4	Evaluate different hashing techniques and collision resolution methods for effective data storage and retrieval.	L5	Evaluate

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE	50%	100% course contents

Course Contents:

UNIT 1 **Introduction to Data Structure** **6 Hours**

Data Structures, Types of Data Structures, Algorithm and its efficiency, Notations for analysis of an algorithm, Recursion-Tower of Hanoi, Ackermann's function

UNIT 2 **Stacks and Queues** **6 Hours**

Stack- Definition, operations, representations using array, Linked List, Queue- Definition, operations, Types of Queue Linear Queue,Double Ended Queue, Circular Queue, Priority Queues, applications, representation using array and Linked list.

UNIT 3 **Linked List** **6 Hours**

Linked List and its Types-Singly Linked List, Circular Linked List, Doubly Linked List, Applications of Linked List: Polynomial Representation and Polynomial Arithmetic. Reversing a string

UNIT 4 **Trees** **8 Hours**

Basic terminology, binary tree and its representation, binary tree traversal methods, binary search tree, AVL tree, B tree, B+ tree, Heaps and its operations, M-way Search Tree,,RB trees

UNIT 5	**Graphs**	**8 Hours**
Graph Terminologies, Representation of the Graph- Adjacency Matrix and Adjacency List, Graph Traversal Techniques- BFS and DFS, Warshall's Algorithm, Shortest Path Algorithm, Dijkshtra algorithm, spanning tree algorithms,		
UNIT 6	**Hashing**	**6 Hours**
Hashing – concept, hashing methods, hash collision, hash collision resolution methods.		

Text Books:

1. Data Structure using C- A. M. Tanenbaum, Y. Langsam, M. J. Augenstein (PHI)
2. Data Structures- A Pseudo code Approach with C – Richard F. Gilberg and Behrouz A. Forouzon, Cengage Learning, Second Edition.
3. Schaum's Outlines Data Structures – Seymour Lipschutz (MGH), Tata McGraw-Hill.

Reference Books:

1. Fundamentals of Data Structures – Horowitz, Sahni CBS India
2. An introduction to data structures with Applications- Jean-Paul Tremblay, Paul. G. Soresan, Tata McGraw Hill International Editions, Second Edition.

Web Resources:

https://onlinecourses.swayam2.ac.in/nou25_cs06/preview

Course Code:	UAMPC0304	L	T	P	Credit
Course Name:	Database Management System	3			3

Course Prerequsites:

Basic Computer Skills, Programming skills, Mathematics skills, Data Structures, Computer Science Fundamentals, Database Concepts.

Course Description:

This course presents the fundamental concepts of database design and use. It provides a study of data models, data□description languages, relational algebra, SQL, data normalization and transactions.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Explain the fundamental database concepts. .	L2	Understand
CO2	Apply the normalization techniques and SQL queries on database.	L3	Apply
CO3	Interpret various indexing and concurrency control techniques.	L2	Understand
CO4	Develop a relational and NoSQL database for data storage and retrieval.	L6	Create

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1 — Introduction to Database Concepts — 8 Hours

Purpose of Database Systems, View of Data, Data Models, Database Architecture, Roles in Database Environment, The Entity-Relationship Model, Entity-Relationship Diagrams, Reduction to Relational Schemas, Introduction to Relational Model, Relational Query Languages- The Relational Algebra.

UNIT 2 — Relational Database Design — 6 Hours

The purpose of Normalization, Data Redundancies and Update Anomalies, Functional Dependencies, The Process of Normalization, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form

UNIT 3 — Relational Model and Structured query Language — 8 Hours

Structure of Relational Databases, SQL Data Definition Language, Basic Structure of SQL Queries, Primary key Foreign key, Cursors, Views, Procedures, indexes, triggers, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database, Join Expressions, Views, Integrity Constraints, Accessing SQL from a Programming Language, Side Effect of Schema Update

UNIT 4 — Transactions and Concurrency Control — 8 Hours

Simple Transaction Model, Serializability, Concurrency Control- Lock-Based Protocols, Two phase locking protocols, Graph-based protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols

UNIT 5 — File Structure, Indexing and Hashing — 7 Hours

Overview of Physical Storage Media, File Organization, Organization of Records in Files, Data-Dictionary Storage, Database Buffer. Basic Concepts of Indexing and Hashing, Ordered Indices, B+-Tree Index Files, B- Tree Index Files, Multiple-Key Access, Static Hashing, Dynamic Hashing		
UNIT 6	**Overview of NoSQL**	**8 Hours**
Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, JSON File introduction, Introduction to Mongodb database		
Text Books:		
1. Fundamentals of Database Systems – by Ramez Elmasri and Shamkant Navathe Publisher -Pearson Education, 5th Edition. 2. Database Systems: Design, Implementation and Management.- PeterRof, Carlos Coronel (7th Edition), CengageLearning.		
Reference Books:		
1. Database System Concept by Henry F. Korth, Abraham Silberschatz, Sudarshan (McGraw Hill Inc.) Sixth Edition. 2. Database Systems- A practical approach to Design, Implementation and Management by Thomos Connolly, Carolyn Begg, 3rd Edition, Pearson Education		
Web Resources:		
1.https://onlinecourses.nptel.ac.in/noc25_cs40/preview 2.https://www.udemy.com/course/introduction-to-nosql-databases/?srsltid=AfmBOopI3jrWmiF5McA5jVu2soIhCZxXRt23q57uDCAdqQKiab1aJbD5		

Title of the Course: Constitution of India Course Code: UAMVE0305	L	T	P	Credit
	2	-	-	2

Course Pre-Requisite: Basics of Indian History, Independence Movement, Fundamentals of Civics.

Course Description: This Course is an introduction of Indian Constitution and basic concepts highlighted in this course for understanding the Constitution of India. This course is structured to give a deeper insight for making the nexus between the other law subjects.

Course Objectives

At the end of the course the student is expected to have acquired:

1. A basic understanding of Constitution of India.
2. Builds the ability to apply the knowledge gained from the course to current social legal issues.
3. Ability to understand and solve the contemporary challenges.
4. Understanding constitutional remedies.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Bloom's Cognitive Descriptor
CO1	**Explain** the significance of Indian Constitution as the fundamental law of the land	II	Cognitive (Understand)
CO2	Exercise his fundamental rights in proper sense at the same time **Identifies** his responsibilities in national building.	II	Cognitive (Applying)
CO3	**Analyze** the Indian political system, the powers and functions of the Union, State and Local Governments in detail	II	Cognitive (Understand)
CO4	**Understand** Electoral Process, Emergency provisions and Amendment procedure.	II	Cognitive (Understand)

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO1						3		3				3			
CO2						3		3	3	3		3			
CO3						3			3			3			
CO4						3			3			3			

Assessments:

Teacher Assessment:

One End Semester Examination (ESE) having 100% weights respectively.

Assessment	Marks
ESE	100

ESE: Assessment is based on 100% course content

Course Contents:

Unit 1:- Constitution – Structure and Principles 1.1: Meaning and importance of Constitution 1.2: Making of Indian Constitution – Sources 1.3: Salient features of Indian Constitution	**(03) Hrs**
Unit 2:- Fundamental Rights and Directive Principles 2.1: Fundamental Rights & Fundamental Duties 2.2: Directive Principles of State Policy	**(10) Hrs**

Unit 3:- Union Government & Executive 3.1: President of India – Qualification, Powers and Impeachment 3.2: Lok Sabha & Rajya Sabha Sabha- Composition, Powers & Functions, Scope to amendment in Constitution	**(04) Hrs**
Unit 4:- State Government & Executive 4.1: Governor – Qualification, Appointment, Powers & Functions 4.2: Legislative Assembly & Legislative Council – Composition, Powers & Functions	**(03) Hrs**
Unit 5:- The Judiciary 5.1: Features of Judicial System in India 5.2: Hierarchy of Courts, Composition and Jurisdiction	**(03) Hrs**
Unit 6:- Local Self Government and other constitutional Organizations 6.1: 73rd and 74th Constitutional Amendments 6.2: Public Service Commission, Election Commission, CAG, National Commissions for SC, ST etc.	**(03) Hrs**

Textbooks:

1. M.P. Jain, Indian Constitutional Law
2. M.P. Singh (ed.),V.N. Shukla, Constitutional Law of India
3. D.D. Basu, Commentary on the Constitution of India
4. S.S. Desai, Constitutional Law--I & II

References:

1. Durga Das Basu, Introduction to the Constitution of India, Gurgaon; LexisNexis, 2018 (23rd edn.)
2. J.N. Pandey, The Constitutional Law of India, Allahabad; Central Law Agency, 2018 (55th edn.)
3. Shripad Shridhar Desai, Constitutional Law--I, S.S. Law Publication, 2021
4. Shripad Shridhar Desai, Constitutional Law --II, S.S. Law Publication, 2021
5. Constitution of India (Full Text), India.gov.in., National Portal of India, https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf
6. Durga Das Basu, Bharatada Samvidhana Parichaya, Gurgaon; LexisNexis Butterworths Wadhwa, 2015

Course Code:	UAMEM0306	L	T	P	Credit
Course Name:	Principles of AIML	2			2

Course Prerequsites:

Basic Programming Concepts

Course Description:

Principles of artificial Intelligence is the simulation of intelligence processes by computer systems. It gives an understanding of the main abstractions and reasoning techniques used in artificial intelligence, including understand of AI, reasoning by machines, planning techniques, and basic machine learning methods.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Explain basic theories and concepts necessary for building an Artificial Intelligent System for knowledge representation.	L2	Understand
CO2	Analyze different search technique algorithms	L4	Analyze
CO3	Apply reasoning techniques for knowledge representation using probability, logic, and rule-based systems.	L3	Apply
CO4	Apply machine learning algorithms for different problems.	L3	Apply

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)		
2	Mid Semester Examination (MSE)		
3	In Semester Evaluation 2 (ISE2)		
4	End Semester Examination (ESE)	100%	100% course contents

Course Contents:

UNIT 1	Introduction to Artificial Intelligence and Problem- Solving Agent	7 Hours

Introduction to AI, Intelligent Agents, Agents & environment, nature of the environment, structure of agents, goal-based agents, utility-based agents, learning agents. Defining the problem as state space search, production system, problem characteristics, and issues in the design of search programs.

UNIT 2	Search Techniques	7 Hours

Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best -first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.

UNIT 3	Knowledge & Reasoning	7 Hours

Statistical Reasoning: Probability and Bayes' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. AI for knowledge representation, rule- based knowledge representation, procedural and declarative knowledge, Logic programming, Forward and backward reasoning.

UNIT 4	**Introduction to Machine Learning**	**7 Hours**

Exploring sub-discipline of AI: Machine Learning, Supervised learning, Unsupervised learning, Reinforcement learning, Classification problems, Regression problems, Clustering problems, Introduction to neural networks and deep learning.

Text Books:

1.S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall, Third Edition, 2015.
2. Nils J. Nilsson, “Artificial Intelligence: A New Synthesis”, 1st Edition, Morgan- Kaufmann, 1998.

Reference Books:

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, “Artificial Intelligence”, McGraw Hill, 3rd ed.,2017.
2. Patterson, “Introduction to Artificial Intelligence & Expert Systems”, Pearson, 1st ed. 2015.
3. Saroj Kaushik, “Logic & Prolog Programming”, New Age International, Ist edition, 2002.
4. Joseph C. Giarratano,Gary D. Riley, “Expert Systems: Principles and Programming”, 4th Edition, 2007.

Web-Resources:

1.https://www.udemy.com/course/ai-for-beginners 2. https://www.coursera.org/specializations/machine-learning-introduction

Course Code:	UAMPC0331	T	P	Credit
Course Name:	Advanced Data Structures Laboratory		2	1

Course Prerequsites:

C programming, Linear Data structure

Course Description:

This course covers Introduction to implementation of Linear Data structure, Linked List and its applications. It implements non-Linear data structures Viz. Tress and Graphs in depth. This course also implements sorting techniques and Hashing

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Construct a C Code for implementation of various linear and non-linear data structures.	L3	Construct
CO2	Apply linear and non-linear data structures to solve certain real life problems.	L3	Apply
CO3	Implement various sorting methods, Hashing and collision resolution techniques.	L3	Implement

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	3	2					2	1	2
CO2	2	2	2	2	3	2					3	3	3
CO3	2	2	2	2	3	3					3	3	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	100%	Quiz/Assignments/Group Discussions/Internal oral
2	ESE(POE)	100%	Assesment is based on practicle oral performance

Course Contents:

Note: Implement all the programs in "C " Programming Language and Linux OS

EXPERIMENT NO. 1 **Recursion** **2 Hours**

Write a recursive function to solve the Tower of Hanoi puzzle for n disks and display each move step-by-step, showing how disks are transferred from the source peg to the target peg using an auxiliary peg.

Example Output for n=3:

Move disk 1 from A to C
Move disk 2 from A to B
Move disk 1 from C to B
Move disk 3 from A to C
Move disk 1 from B to A
Move disk 2 from B to C
Move disk 1 from A to C

EXPERIMENT NO. 2	**Stack**	**2 Hours**
Develop a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations		
EXPERIMENT NO. 3	**Queue**	**2 Hours**
Develop a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.		
EXPERIMENT NO. 4	**Linked List**	**4 Hours**
Develop a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations		
EXPERIMENT NO. 5	**Linked List Application**	**4 Hours**
Develop a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Programme, Sem, PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) e. Exit		
EXPERIMENT NO. 6	**Binary Search Tree**	**2 Hours**

Develop a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo

a. Create a DLL of N Employees Data by using end insertion.
b. Display the status of DLL and count the number of nodes in it
c. Perform Insertion and Deletion at End of DLL
d. Perform Insertion and Deletion at Front of DLL
e. Demonstrate how this DLL can be used as Double Ended Queue.
f. Exit

EXPERIMENT NO. 7	**AVL Tree**	**2 Hours**

Develop a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers .

a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2
b. Traverse the BST in Inorder, Preorder and Post Order
c. Search the BST for a given element (KEY) and report the appropriate message
d. Exit

EXPERIMENT NO. 8	**Graph**	**4 Hours**

Develop a Program in C for the following operations on Graph(G) of Cities

a. Create a Graph of N cities using Adjacency Matrix.
b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method

EXPERIMENT NO. 9	**Shortest Path Algorithm**	**4 Hours**

Implement the following shortest path algorithms:

1. Dijkstra's Algorithm
2. Bellman-Ford Algorithm
3. Floyd-Warshall Algorithm

Analyze each algorithm's approach to solving shortest path problems in weighted graphs.

EXPERIMENT NO. 10	**Hashing**	**4 Hours**

Given a File of N employee records with a set K of Keys (4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Develop a Program in C that uses Hash function H: K →L as H(K)=K mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.

Text Books:

1. Data Structure using C- A. M. Tanenbaum, Y. Langsam, M. J. Augenstein (PHI)
2. Data Structures- A Pseudo code Approach with C – Richard F. Gilberg and Behrouz A. Forouzon, Cengage Learning, Second Edition
3. Schaum’s Outlines Data Structures – Seymour Lipschutz (MGH), Tata McGraw-Hill.

Course Code:	UAMPC0332	L	T	P	Credit
Course Name:	Database Management System Laboratory			2	1

Course Prerequsites:

Basic Computer Skills, Programming skills, Mathematics skills, Data Structures, Computer Science Fundamentals, Database Concepts.

Course Description:

Upon completion, student should be able to write programs for database design and execute SQL and document oriented databases queries

Course Outcomes:	After the completion of the course the student will be able to -	BL	Descriptio
CO1	Design conceptual models of a database using ER modelling	L3	Apply
CO2	Apply normalization techniques for database design.	L4	Analyze
CO3	Develop relational models using SQL and NoSQL databases.	L3	Develop

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	2	1	1	2	2	1		2	2
CO2	3	2	1	1	3		1	3	1	1		3	1
CO3	2	2	2	2	3	2		2	2	1		3	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	50%	Quiz/Assignments/Group Discussions/Internal oral
2	ESE(POE)	50%	Assesment is based on practicle oral performance

Course Contents:

EXPERIMENT NO. 1	Entity-Reltionship Diagram(ER-diagram)	4 Hours

Draw ER diagram for your application use case using any suitable software & convert it into table.

EXPERIMENT NO. 2	Key Management in Tables	4 Hours

Consider your application database ER Diagram and create tables, Primary key and Foreign keys for tables.

EXPERIMENT NO. 3	Views and Indexing in Database	2 Hours

Consider your application database and create views, indexes for your application schema. Perform testing of views.

EXPERIMENT NO. 4	Normalization in Database	2 Hours

Consider your application database with 10 tables. Apply step by step normalization and understand how manipulation of rows and column data		
EXPERIMENT NO. 5	**DDL and DML in Database**	**2 Hours**
Consider your application database, use thick client and thin client tools to perform create, add, update, delete, drop operation for your application schema.		
EXPERIMENT NO. 6	**Concurrency Control**	**2 Hours**
Write a program to implement any concurrency control protocol.		
EXPERIMENT NO. 7	**Functions using PL/SQL**	**2 Hours**
Write a PL/SQL program to demonstrate Functions.		
EXPERIMENT NO. 8	**NoSQL Databases**	**4 Hours**
Perform installation of NoSQL database and explore the tools and commands available with database		
EXPERIMENT NO. 9	**CRUD Operation in MongoDB**	**4 Hours**
Design a simple NoSQL database e. g. MongoDB (Installation, Basic CRUD operations, Execution).		
EXPERIMENT NO. 10	**Pipelining in MongoDB**	**4 Hours**
Design a MongoDB database Logical Selectors, Aggregate Function with pipelines Geospatial Operation, Projection operations and different pipelines on the given datasource.		
Text Books:		
1. Fundamentals of Database Systems – by Ramez Elmasri and Shamkant Navathe Publisher -Pearson Education, 5th Edition. 2. MongoDB Complete Guide by Manu Sharma 1st ed,bpb publication ,2023.		
Refrence Books:		
1. Database System Concept by Henry F. Korth, Abraham Silberschatz, Sudarshan (McGraw Hill Inc.) Sixth Edition. 2. Database Systems- A practical approach to Design, Implementation and Management by Thomos Connolly, Carolyn Begg, 3rd Edition, Pearson Education.		
Web Resources:		
1. installation ofMongoDBVideo: https://www.youtube.com/watch?v=dEm2AS5amyA 2. video onAggregation: https://www.youtube.com/watch?v=vx1C8EyTa7Y 3. MongoDB inactionbookCodedownloadURL:https://www.manning.com/downloads/529 4. MongoDB ExerciseURL: https://www.w3resource.com/mongodb-exercises/ 5. https://www.udemy.com/course/introduction-to-nosql-databases/srsltid=AfmBOopI3jrWmiF5McA5jVu2soIhCZxXRt23q57uDCAdqQKiab1aJbD5		

Course Code:	UAMPC0333	L	T	P	Credit
Course Name:	Software System Tools Laboratory			2	1

Course Prerequsites:

Software Development Life Cycle, Basic Computer Knowledge.

Course Description:

In Software Systems students will learn necessary tools and techniques required for report writing and project management. This course will empower students with knowledge and practices that will help student in versioning projects, testing authenticity of work, generating reports and developing build for deployment of project.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	**Apply** report writing tools and plagiarism testing tools for checking research work for genuine and authenticity.	III	Apply
CO2	**Evaluate** the progress of project using Smart Tools & Technologies in Industry 4.0 project management tools.	V	Evaluate
CO3	**Design** the user experience prototype, UML diagrams & visualization using various tools.	VI	Create

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	2			1	3		3		3	3	2	3	3	
CO2	2	2	2	2	3		1		3	3	2	3	3	
CO3	2	3	3	3	3		1		3	3	2	3	3	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	100%	Quiz/Assignments/Internal oral
2	ESE(POE)	NA	NA

Course Contents:

EXPERIMENT NO. 1	Problem Solving using RAPTOR Tool	4 Hours

Explore the RAPTOR Tool :- A flow chart interpreter for visual algorithm design.

Design the executable flow charts using RAPTOR tool for the following problem statements

a. To find whether a given number is Armstrong / Strong/ Palindrome or not.

b. To find the prime numbers between a given range.

c. To display Fibonacci series upto nth term.

d. To find the factorial of a given number using recursion.

EXPERIMENT NO. 2	LaTeX Document Formatting and Graphics Insertion	2 Hours

Create a technical report, resume, PPT using LaTeX, including sections, figures, and tables.		
EXPERIMENT NO. 3	**Language Checking and Plagiarism Detection**	**2 Hours**
Design review research paper using latex check the plagiarism and use Language Checking tools		
EXPERIMENT NO. 4	**Agile Project Management with JIRA**	**4 Hours**
a. To Create user stories, plan sprints, and track progress using JIRA boards. b. Explore different types of Software Development Life Cycle (SDLC) models Waterfall Model, Iterative Model , Spiral Model, Agile Model, Incremental Model, V-models (Verification and Validation Models), DevOps SDLC Models, Rapid Application Development (RAD). c. SDLC Process setup using JIRA		
EXPERIMENT NO. 5	**Build management system.**	**2 Hours**
To Installation Build tools understand the basics of Maven as a build management system. Understand the concepts of building, installing, and configuring software.		
EXPERIMENT NO. 6	**Git and GitHub**	**2 Hours**
Version Control and Collaboration: Leveraging GitHub for Team-Based Development Projects		
EXPERIMENT NO. 7	**Ideas Boards**	**2 Hours**
Explore tools for Project Planning and Management		
EXPERIMENT NO. 8	**Weka**	**2 Hours**
Exploring Machine Learning with Weka: Hands-On Data Analysis and Modelling		
EXPERIMENT NO. 9	**Introduction to Data Platform Tools**	**2 Hours**
Explore tools like Canva for data visualization and analysis.		
EXPERIMENT NO. 10	**UI-UX Designing**	**2 Hours**
User Experience Design: Prototyping Wireframes using Figma and Creating Idea Boards		
EXPERIMENT NO. 11	**Creating UML Diagrams with StarUML and Rational Rose**	**4 Hours**

Design UML diagrams using StarUML and Rational Rose. (Using Object-Oriented Concepts Used in UML Diagrams.) **Structural Diagrams:** Class diagrams, Object Diagram, Sequence diagrams , Component Diagram, Deployment Diagram,Package diagrams.
Behavioral UML Diagrams:- Use Case Diagrams, Sequence Diagram, Communication Diagram, State Machine Diagrams, Activity Diagrams, Timing Diagram.

EXPERIMENT NO. 12	**Watson Deep Learning Exploration**	**2 Hours**

Create the IBM Watson's deep learning tools to train a neural network on a sample dataset and analyze the results.

Text Books:

1. LaTeX: A Document Preparation System (2nd Edition)by Leslie Lamport
2. Learning Agile by Andrew Stellman & Jennifer Greene
3. Learning Python: Powerful Object-Oriented Programming 4th Edition by Mark Lutz
4. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition by Hadley Wickham, Garrett Grolemund
5. Smart Product Design, Sendpoints Publications, 2017

Reference Books:

1. Git online documentation. https://git-scm.com/docs/git-help
2. Pyplot online documentation https://matplotlib.org/api/pyplot_api.html.

Web Resources:

1. Udemy Course on "Learn LaTex - The Complete LaTex Course " - bit.ly/4niI1Uc
2. Udemy Course on "The Complete JIRA Agile Project Management" - bit.ly/4lmvLjJ

Course Code:	UAMIL0371	L	T	P	Credit
Course Name:	Mini Project-I	-	-	2	1

Course
Knowledge of Project Based Learning (PBL) concepts.

Course
In this mini project, the students will apply Project Based Learning to a multi-course environment for solving different real-world problems. The students shall use the concepts they have learned in their ongoing semester (i.e. Sem III). Students should develop a solution to an identified problem.

Course Outcomes:	After the completion of the course the student will be able to -	Bloom's	Description
CO1	Identify real world problems related to CSE and AIML domain.	L2	Understand
CO2	Apply appropriate tools, technologies and algorithms to devlop functional prototype/solution.	L3	Apply
CO3	Analyze the performance of developed solution through different metrics.	L4	Analyze
CO4	Demonstrate the work done through teamwork, documentation and presentation.	L6	Create

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	100%	In Semester Evaluation based on Progress of the project

Course Contents:

Guidelines for Mini Project -I

1. The primary objective of the mini project-I is to achieve multi course project based learning.
2. Course Instructor shall form the project team of 3 to 4 students in the batch of students.
3. Each team shall use the knowledge of Data Structre , DBMS courses whihc they are studying in the SY B.Tech to identify the real world problem which can be solved using technology.
4.The solution shall be using the tools & techniques from multiple courses - e.g. a solution shall be using data structures, DBMS, algorithm , basic Web development, html front etc. to develop mini project.
6. The evaluation shall be done in two phases:
Phase 1: Students shall be graded based on the skills demonstrated to identify the problem statement, define the problem statement & Designing its solution. The partial working model is expected to be completed.
Phase 2: Students shall be graded based on the complete project implementation and its working. Followed by the detailed project report which shall cover the technical aspects of the project.
7. Its recommended to share a common project report format to all batches.
8. All course instructors shall coordinate and work towards common evaluation process.
9. Course instructors shall demonstrate and discuss sample case studies with students to help them understand the mini project deliverables.
10. It's recommended to share a common project report format to all batches.
11.All course instructors shall coordinate and work towards a common evaluation process.
12.Course instructors shall demonstrate and discuss sample case studies with students to help them understand the mini project deliverables. 13. Design using UML, classes diagram and ER diagram.

Department of _ CSE (AIML)Curriculum and Syllabus for B. Tech. CSE(AIML) Scheme: 2024-25 (As Per NEP)

Multi-Disciplinary Minor Courses							
Sr. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1	UAMMM0341	Basics of Biomedical Engineering (MM-I)	2	-	-	2	2
2	UAMMM0342	Fundamentals of Finance for Engineering (MM-I)	2	-	-	2	2
3	UAMMM0343	Digital Electronics (MM-I)	2	-	-	2	2

Course Code:	UAMMM0341	L	T	P	Credit
Course Name:	Basics of Biomedical Engineering	2			2

Course Prerequsites:

Mathematics, Programming, Basic concepts in biology and physiology

Course Description:

This course introduces students to the fundamental principles and applications of biomedical engineering. Students will gain an understanding of human anatomy and physiology, biomedical instrumentation, medical imaging techniques, and data analysis methods. Emphasis will be placed on the interdisciplinary nature of

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Describe the scope, evolution, and ethics of Biomedical Engineering.	L2	Understand
CO2	Explain basic anatomy, physiology, and medical imaging.	L2	Understand
CO3	Analyze and design biomedical instruments and devices.	L4	Analysis
CO4	Apply AI/ML techniques to biomedical data and applications	L3	Apply

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	--	--
2	Mid Semester Examination (MSE)	--	--
3	In Semester Evaluation 2 (ISE2)	--	--
4	End Semester Examination (ESE)	100%	100% course contents

Course Contents:

UNIT 1	Introduction to Biomedical Engineering	8 Hours

Definition and Scope of Biomedical Engineering,Historical Development and Evolution of the Field, Importance and Applications of Biomedical Engineering in Healthcare, Ethical and Regulatory Considerations in Biomedical Engineering.

UNIT 2	Anatomy and Physiology Fundamentals	9 Hours

Basic Human Anatomy and Physiology, Overview of Organ Systems: Cardiovascular, Respiratory, Nervous, etc. Biomechanics and Biomaterials in Biomedical Engineering, Introduction to Medical Imaging Techniques

UNIT 3	Biomedical Instrumentation and Devices	6 Hours

Principles of Biomedical Instrumentation, Measurement Techniques in Biomedical Engineering, Types of Biomedical Devices: Diagnostic, Therapeutic, Monitoring, etc., Design and Development of Biomedical Devices

UNIT 4	Data Analysis and AI in Biomedical Engineering	7 Hours

Applications of Artificial Intelligence and Machine Learning in Biomedical Engineering, Case Studies and Examples of AI Applications in Healthcare.
Text Books:
1. "Introduction to Biomedical Engineering" by John Enderle, Susan Blanchard, and Joseph Bronzino
Reference Books:
1. "Biomedical Engineering: Bridging Medicine and Technology" by W. Mark 2. "Fundamentals of Biomedical Engineering" edited by G. K. Viswanath 3. "Biomedical Instrumentation and Measurements" by Leslie Cromwell, Fred J. Weibell, and Erich A. Pfeiffer 4. "Medical Imaging Signals and Systems" by Jerry L. Prince and Jonathan Links 5. "Biomechanics: Concepts and Applications" by Gordon R. Oatis
Web Resources:
1. Coursera – Introduction to Biomedical Engineering (Georgia Tech) https://www.coursera.org/learn/intro-biomedical-engineering 2. NPTEL – Biomedical Engineering (IIT Madras) https://nptel.ac.in/courses/108/105/108105101/

Course Code:	UAMMM0342	L	T	P	Credit
Course Name:	Fundamental of Finance for Engineers	2			2

Course Prerequsites:

Basic understanding of arithmetic and mathematics, Familiarity with business terminology

Course Description:

This course is designed to equip engineering students with a solid foundation in accounting and financial analysis. Learners will explore core accounting principles, learn to interpret financial statements, and understand key financial metrics such as gross profit, net profit, and ROI. The course also covers the impact of dividends, depreciation, taxes, and reserves on overall financial performance.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Understand fundamental accounting principles and financial statements including cash flow, balance sheet, and profit & loss accounts.	L2	Understand
CO2	Analyze financial performance using concepts of revenue, expenditure, profit, ratio	L4	Analyse
CO3	Analyse startup financing options and apply project budgeting and cost-tracking methods	L4	Analyse
CO4	Apply principles of personal financial planning and evaluate investment options such as mutual funds, equity, and government schemes.	L3	Apply

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	2	2	2	2							2	1	2	
CO2	2	2	2								2	2	2	
CO3	2	2		2					2	2	2	2	2	
CO4	2	2	2	2							2	2	2	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	--	--
2	Mid Semester Examination (MSE)	--	--
3	In Semester Evaluation 2 (ISE2)	--	--
4	End Semester Examination (ESE)	100%	100% course contents

Course Contents:

UNIT 1	Accounting Foundations and Financial Statements Analysis	8 Hours

Understanding types of accounts-Basic Accounting Process-Overview of Assets, Liabilities and Net worth- Depreciation-Introduction to Cash Flow Statements-Basic Understanding of Balance Sheet and Profit & Loss Account with Simple Examples.B32Financial Performance Metrics and Cost Management

UNIT 2	Financial Performance Metrics and Cost Management	9 Hours

Conceptual Understanding of Revenue and Capital Expenditure- Explaining Gross & Net Profit-Basic ratio analysis Overview of Dividends and Taxes-Sources of Finance of a Business

UNIT 3	Financing for Startups and Project Management	6 Hours

Introduction to Government Schemes for Startups-Sources of Funding a Startup-Overview of Project Budgeting and Expenditure Management- Importance of Cost Tracking in Project Execution-Pitch presentation

UNIT 4	Personal Finance and Investment Management	7 Hours
Introduction to Personal Financial Planning-Key Savings and Investment Options: Debt vs. Equity-Basics of Mutual Funds and their Benefits-Brief Introduction to the Stock Market-Overview of Government and Private Agencies for Financial Assistance		
Text Books:		
1. "Financial Accounting" by Jerry J. Weygandt, Paul D. Kimmel, and Donald E. Kieso		
Reference Books:		
1. "The Total Money Makeover: A Proven Plan for Financial Fitness" by Dave Ramsey 2. "Financial Management: Theory & Practice" by Eugene F. Brigham and Michael C. Ehrhardt		
Web Resources:		
1. NPTEL – Financial Management for Managers (IIT Kharagpur) https://www.coursera.org/learn/finance-for-engineers 2.Coursera – Finance for Engineers (Columbia University) https://nptel.ac.in/courses/110/105/110105121/		

Course Code:	UAMMM0343	L	T	P	Credit
Course Name:	Digital Electronics	2			2

Course Prerequsites:

Basic knowledge of numbering system and logic gates.

Course Description:

It is a core and fundamental subject. The course focuses on basic skills in method of design.
and analysis of digital system like counters, registers,FSM etc

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Understand Boolean expressions and simplify logical functions using logic gates and K-maps.	L2	Understand
CO2	Design and implement combinational logic circuits such as adders, encoders, multiplexers.	L2	Understand
CO3	Analyze sequential circuits including flip-flops, latches, and counters for timing operations.	L4	Analysis
CO4	Apply knowledge of digital logic families and memory devices to evaluate system design.	L3	Apply

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	2	2									2	2		
CO2	2	2	2		2						2	2	2	
CO3	2	2	2	2	2						2	2	2	
CO3	2	2	2		2						2	2	2	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	--	--
2	Mid Semester Examination (MSE)	--	--
3	In Semester Evaluation 2 (ISE2)	--	--
4	End Semester Examination (ESE)	100%	100% course contents

Course Contents:

UNIT 1 Logic Simplification and Combinational Logic Circuits — **8 Hours**

Boolean expression & representation using logic gates, Boolean optimization, K-map optimization ,Adder, Subtractor, code converters (binary to gray & gray to binary, BCD to Excess 3 and vice versa, BCD to 7 segment display), Multiplexer and Demultiplexer, encoder, priority encoder, decoder, adder with look ahead carry generator

UNIT 2 Sequential Logic Circuits — **7 Hours**

Types of 1 Bit Memory Cell Flip-flop & Timing Circuits: SR latch, Gated latch, Edge triggered flip-plop:- D, JK, T Flip-flop, flip flop asynchronous inputs ,characteristic table of Flip-flop,

UNIT 3 Applications Sequential Logic Circuits — **7 Hours**

Shit resistor,r SISO, SIPO, PISO, PIPO,universal shift resistor. Counter,up-down counter, Mod-n counter, synchronous counter, Ring counter

UNIT 4 Logic Families — **8 Hours**

Characteristic of Digital ICs, Transistor – Transistor Logic, Complementary MOS (CMOS) Logic, Comparison of TTL and CMOS families. Memory Devices: ROM, PROM, EPROM, EEPROM, RAM, SRAM, DRAM

Text Books:	
1. Anand Kumar _Fundamentals of Digital Circuits‘--. PHI 2. M. Morris Mano _Digital Design‘-- (Third Edition),. PHI	
Reference Books:	
1. Willim I. Fletcher.‘An Engineering Approach to Digital Design‘—PHI/ Pearson 2. NormanBalabanianBradle Carlson. _Digital Logic Design Principals,.‘ Wiley Publication. 3. Rajkamal _Digital Systems Principals and Design‘—Pearson 4. A.P. Malvino, D.P. Leach _Digital Principles &Applications‘ -VIth Edition-Tata McGraw Hill, Publication.	
Web Resources:	
1. NPTEL – Digital Electronic Circuits (IIT Kharagpur) https://nptel.ac.in/courses/117/105/117105080 2. Coursera – Introduction to Digital Systems https://www.coursera.org/learn/digital-systems 3. MIT OpenCourseWare – Digital Systems https://ocw.mit.edu/courses/6-111-introductory-digital-systems-laboratory-fall-2006/ 4. Udemy – Digital Electronics & Logic Design https://www.udemy.com/course/digital-electronics-course/	

SEMESTER IV													
Sr. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs/ Week**	**Credits**	**Evaluation Scheme (Components)**				
1	PC	UAMPC0401	Computer Networks	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20		40
2	PC	UAMPC0402	Automata Theory	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20		40
3	PC	UAMPC0403	Design And Analysis of Algorithms	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20		40
4	PC	UAMPC0404	Statistics and Probability	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20		40
5	PC	UAMPC0405	Object Oriented Programming in Java	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20		40
6	VEC	UAMVE0406	Environmental Studies	2	-	-	2	2	ISE	50	20		20
7	PC	UAMPC0431	Object Oriented Programming Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10		
8	PC	UAMPC0432	Data Analytics & Visualization Tools Laboratory	-	-	2	2	1	ISE	25	10		
9	OJT	UAMIL0471	Mini Project-II	-	-	2	2	1	ISE	25	10		
10	VSEC	UAMVS0433	AI DS Tools Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10		
11	CC	UAMCC0434	Co-curricular Activities-II	-	-	2	2	1	ISE	50	20		
12	MM	UAMMM04**	MM-2	3	-		3	3	ESE	100	40		
						Total:	**28**	**23**	**Total Marks: 850** **Total Credit: 23**				

Course Code:	UAMPC0401	L	T	P	Credit
Course Name:	Computer Networks	2	-	-	2

Course Prerequsites:

Basic knowledge of numbering system and logic gates.

Course Description:

This course provides a fundamental understanding of the networking concepts such as — communication medium, topologies, protocols, networking models, addresses used in the networks. Students will get a sound understanding of the working of the wired networks

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Explain the fundamental concepts of computer networks.	L2	Understand
CO2	Identify the working of different protocols at physical and data link layer.	L2	Understand
CO3	Apply the concpets from network and transport layer (such as TCP/IP) to identify and solve various problems at these layers.	L3	Apply
CO4	Select a appropriate application level protocol depending on the network scenario.	L3	Apply

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 1 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents. (50 Marks)

Course Contents:

UNIT-I	Introduction of Computer Networks	7 Hours

Components of Communication,Modes of Communication,Computer Networks Definition,Network Devices, Classification of Computer Networks, Network Topologies, OSI and TCP/IP Model

UNIT-II	Physical and Data Link Layer	8 Hours

Physical Layer Topics-Guided and Unguided Media, Errors in Transmission, Analog and Digital Signals, Encoding Techniques Line and Block Encoding
Data Link Layer Topics- Error Detection and Correction Techniques, Channel Access Methods: ALOHA, CSMA (Carrier Sense Multiple Access), CSMA/CD (CSMA with Collision Detection), CSMA/CA (CSMA with Collision Avoidance)

UNIT-III	Network & Transport Layer	7 Hours

Network Layer - Introduction to IPv4 and IPv6,Subnet mask, Classful and classless addressing, Subnetting and supernetting, Network layer design issues, Routing algorithms, IP header, Transport Layer - Introduction to Transport Layer, Multiplexing and demultiplexing, Connectionless and connection-oriented services (TCP, UDP), Congestion control algorithms

UNIT-IV	Session, Presentation & Application Layer	8 Hours

Session Layer-Functionality, Protocols, Working. Presentation Layer -Functionality,Protocols, Working
Application Layer-Protocols: DNS, URL, WWW, SNMP, SMTP, IMAP, HTTP, FTP, Application-based simulators

Text Books:

1. A. S. Tanenbaum, "Computer Networks", 5th Edition, PHI 2010

Reference Books:

Behrouz A. Forouzan (2006), Data communication and Networking, 4th Edition, Mc Graw-Hill, India.

Web Resources:

Computer Networks - Prof. S. Ghosh (IIT Kharagpur) : https://nptel.ac.in/courses/106105183

Data Communication - Prof. A. K. Agrawal (IIT Roorkee):
https://archive.nptel.ac.in/courses/106/105/106105082/

Course Code:	UAMPC0402	L	T	P	Credit
Course Name:	Automata Theory	3			3

Course Prerequsites:

Discrete Mathematics, Sets, Cartesian Product and Functions

Course Description:

The Automata Theory course introduce students to a core area of theoretical computer science such as formal languages, Automata, recursion, and computability. Through the study of abstract computational models and formal languages, students will develop a deep understanding of the principles that underlie the design and analysis of algorithms and computational systems.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Explain the formal languages theory and types with their acceptors.	L2	Understand
CO2	Apply automata concepts to the problems in areas such as compiler design, formal verification, Natural Language Processing and Artificial Intelligence.	L3	Apply
CO3	Analyze computational problems to model them using formal language theory and automata.	L4	Analyze
CO4	Select appropriate automata for modeling the solution for various computational engineering problems.	L3	Apply

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1 **Mathematical Induction & Finite Automata** **8 Hours**

Mathematical Preliminaries with basic concepts of languages,The Principle of Mathematical Induction, Inductive proofs, Recursive Definitions, Finite automata-definition and representation, Deterministic Finite Automata(DFA), Non-deterministic Finite Automata(NFA), NFA with null transitions, Equivalence of FA's , NFA's and NFA's with null transitions.

UNIT 2 **Regular languages and Regular Expressions** **6 Hours**

Regular expressions and corresponding regular languages, examples and applications, unions, intersection & complements of regular languages,The Pumping Lemma for Regular Languages, minimizing number of states in Finite Automata, Kleene's Theorem: Part I & II statements and proofs.

UNIT 3 **Context Free Grammars and Languages** **8 Hours**

Context-Free Grammars: Definitions and More Examples, Derivation and ambiguity, Simplified Forms - Eliminating Null productions , Unit productions from CFG, Eliminating useless variables from a context Free Grammar.and Normal Forms - BNF & CNF notations, Converting a CFG to CNF, Parsing: Top-Down, Recursive Descent and Bottom-Up Parsing

UNIT 4 **Pushdown Automata** **6Hours**

Definitions and Examples, Deterministic Pushdown Automata & types of acceptance, Equivalence of CFG's & PDA's		
UNIT 5	**Context-Free and Non-Context-Free Languages**	**8 Hours**
The Pumping Lemma for Context-Free Languages examples, Intersections and Complements of CFLs, intersections and complements, Union, Concatenation and *'s of CFLs,		
UNIT 6	**Turing Machines**	**9 Hours**
Models of computation, definition of Turing Machine as Language acceptors, combining Turing Machines, Computing a function with a TM, Non-deterministic TM and Universal TM, Recursively Enumerable Languages.		
Text Books:		
1.Introduction to languages & Theory of computations – John C. Martin (MGH) –Chapters 1, 2,3,4,5,6,7,8. 2. Discrete Mathematical Structures with applications to Computer Science—J. P. Trembley & Manohar (MGH) -Chapter 1		
Reference Books:		
1. Introduction to Automata Theory, Languages and computation – John E. Hopcraft , Rajeev Motwani , Jeffrey D. Ullman (Pearson Edition). 2. Introduction to Theory of Computations – Michael Sipser (Thomson Brooks / Cole) 3. Theory Of Computation- Vivek Kulkarni, 1st edition OXFORD university Press 4.Theory Of Computation A problem Solving Approach Kavi Mahesh Wiley India		
Web Resources:		
1.https://onlinecourses.nptel.ac.in/noc21_cs83/preview 2.https://onlinecourses.nptel.ac.in/noc25_cs70/preview 3. https://www.udemy.com/course/theory-of-computation-online-course/?couponCode=PMNVD2025		

Course Code:	UAMPC0403	L	T	P	Credit
Course Name:	Design and Analysis of Algorithms	3			3

Course Prerequsites:

Data Structure

Course Description:

This course introduces fundamental concepts and key techniques for designing and analyzing algorithms, while studying and applying different algorithm design methods, including the greedy method, divide-and-conquer, dynamic programming, and backtracking.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Explain basic concepts of algorithms and measure the efficiency of algorithms.	L2	Understand
CO2	Apply various algorithmic strategies to solve real life problems.	L3	Apply
CO3	Analyze the performance efficiency of the designed algorithm's time and space complexity.	L4	Analyze
CO4	Construct a solution for solving complex problem.	L3	Apply

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction	7 Hours

What is algorithm, Algorithm Specification: Pseudocode Conventions, Recursive Algorithm, Performance Analysis: Space Complexity, Time Complexity, Asymptotic Notations, Practical Complexities, Performance Measurement Recurrences: The substitution method, recursion tree method, Master Theorem

UNIT 2	Divide and Conquer	7 Hours

The general method, Binary search, Finding the maximum and minimum, Merge sort, Quick sort,Shell sort and analysis of these algorithms.

UNIT 3	Greedy method	7 Hours

The general method, Fractional Knapsack problem, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge patterns, Huffman codes.

UNIT 4	**Dynamic Programming and Backtracking**	**10 Hours**
Dynamic Programming : The general method, Multistage graphs, Optimal binary search trees, 0/1 knapsack, Reliability design, Traveling Salesperson problem. Backtracking: The general method, 8-queen problem, Sum of subsets, Graph Coloring, Knapsack Problem, Branch & Bound Algorithms , Hamiltonian Cycle		
UNIT 5	**Graph Algorithms: Elementary Graph Algorithms**	**9 Hours**
Representations of graphs, Breadth-first search, Depth first search, Strongly connected components, Minimum Spanning Trees: Growing a minimum spanning tree, The algorithms of Kruskal and Prim, Binary search tree, B+ tree, RB tree Single-Source Shortest Paths: The Bellman-Ford algorithm, Single-source shortest paths in directed acyclic graphs, Dijkstra's algorithm, The Floyd-Warshall algorithm		
UNIT 6	**Complexity Classes :P & NP-Complete**	**5 Hours**
Polynomial time, Polynomial-time verification, Decidability , NP completeness and reducibility, NP-complete problems, string matching algorithms, case studies		
Text Books:		
1.[TCRC] Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms", PHI 2.[ESS] Fundamentals of Computer Algorithms - Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaran, Universities Press, Second Edition.		
Reference Books:		
1. [GP] Fundamentals of Algorithmics – Gilles Brassard, Paul Bratley (Pearson Education). 2. [K] Mastering Algorithms with C – Kyle Loudon (SPD O'Reilly). 3. [SA] Computer Algorithms- Introduction to Design and Analysis – Sara Baase, Allen Van Gelder (Pearson Education).		
Web Resources:		
1 https://www.coursera.org/learn/analysis-of-algorithms 2 https://onlinecourses.nptel.ac.in/noc19_cs47/preview		

Course Code:	UAMPC0405	L	T	P	Credit
Course Name:	Object oriented programming in Java	2			2

Course Prerequsites:

Basic Concepts of Programming

Course Description:

In this course students will be introduced to oop programming environment of Java programming language. Students will learn advanced feature of Java, such as platform independent architecture, JVM, JIT components

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Use knowledge of fundamental and OOP concepts	L2	Understand
CO2	Apply OOP concepts for program design	L3	Apply
CO3	Implement efficient data management techniques using Java Collection Framework for real-world problem-solving	L3	Apply
CO4	Develop programming solutions to given problem	L3	Apply

CO-PO Mapping:

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

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1 — Fundamental Programming in Java — 6 Hours

The Java Programming Environment- JVM, JIT Compiler, A Simple Java Program, , Data Types, Variables, Operators, Strings, Input and Output, Control, Flow Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Passing Information to a Method or a Constructor, Creating and using objects, Controlling Access to Class Members, Static Fields and Methods, this keyword

UNIT 2 — Interface ,Inheritance and Packaging — 8 Hours

Interfaces: Defining an Interface, Implementing an Interface, Using an Interface as a Type, Evolving Interfaces, and Default Methods. Inheritance: Definition, Super classes, and Subclasses, Overriding and Hiding Methods Polymorphism, Inheritance Hierarchies, Super keyword, Final Classes and Methods, Abstract Classes and Methods, casting, Design Hints for Inheritance, Nested classes & Inner Classes
Creating a Package, Naming a Package, Using Package Members, Managing Source and Class Files. Developing and deploying (executable) Jar File.

UNIT 3	**Files IO & Exception Handling**	**8 Hours**

Exception: Definition, Dealing with Errors, The Classification of Exceptions, Declaring Checked Exceptions, Throw an Exception, Creating Exception Classes, Catching Exceptions, Catching Multiple Exceptions, Re-throwing and Chaining Exceptions,
I/OStreams:ByteStream–InputStream,OutputStream,DataInputStream,DataOutputStream,
File Input Stream, File Output Stream, Character Streams, Buffered Stream,Scanner,File,Random Access File.

UNIT 4	**Collection Framework**	**8 Hours**

Collections: Collection Interfaces,Concrete Collections-List,Queue,Set,Map,the Collections Framework.

Text Books:

1.[CH] Cay S.Horstmann. Core Java Volume I - Fundamentals, Pearson 12th Edition 2023
2.[CH] Cay S.Horstmann. Core Java Volume II - Advanced Features, Pearson 12th Edition 2023

Reference Books:

1. [RN] R. Nageswara Rao. Core Java: An Integrated Approach, New: Includes All Versions upto Java 8 Jan 2025

Web Resources:

1. The Java Tutorials From ORACLE Java Documentation URL: http://docs.oracle.com/javase/tutorial/
2. https://onlinecourses.nptel.ac.in/noc25_cs57/preview

Title of the Course: Environmental Studies **Course Code:** UAMVE0406	**L**	**T**	**P**	**Credits**
	2	**-**	**-**	**2**

Course Pre-Requisite: Students shall have knowledge of:

- Basic Science (Physics and Chemistry)

Course Description: The objective of the course is imparting fundamental knowledge and awareness of Environmental Studies among students and importance of conservation of environment.

Course Learning Objectives:

At the end of the course students will be able to :

1. Study scope and importance of natural resources, ecosystems, biodiversity for creating awareness and their conservation in multiple disciplines.
2. Learn various types of pollution, their impacts and control measures for minimizing pollution and sustainable development.
3. Understand social issues related to environment, environmental ethics and human rights towards environment.
4. Study various laws and regulations related to environment and its applicability in society and industries

Course Outcomes:

COs	After the completion of the course the student will be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Summarize natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines	2	Understanding
CO2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.	2	Understanding
CO3	Interpret environmental ethics and their implementation for betterment of environment and human life.	2	Understanding
CO4	Summarize the requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.	2	Understanding

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1							2					
CO2	3											
CO3								2				
CO4						2						

CO	**PSO1**	**PSO2**
CO1		
CO2	1	1
CO3		1
CO4		1

Assessment Scheme:

ESE: Assessment is based on 100% course content

	Assessment Component	Marks	
	ISE	50	

Course Contents:

Unit 1: Nature of Environmental Studies Definition, scope and importance, Multidisciplinary nature of environmental studies, Need for public awareness.	4 **Hrs.**
Unit 2: Natural Resources and Associated Problems a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer-pesticide problems. e) Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. f) Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of individuals in conservation of natural resources.	5 **Hrs.**
Unit 3: Ecosystems Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem, Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem :- a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).	4 **Hrs.**
Unit 4:Biodiversity and its conservation Introduction- Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega- diversity nation, Western Ghat as a biodiversity region. Hot-spot of biodiversity. Threats to biodiversity habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity	4 **Hrs.**
Unit 5: Environmental Pollution Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.	4 **Hrs.**

Unit 6: Social Issues and the Environment Disaster management: floods, earthquake, cyclone, tsunami and landslides. Urban problems related to energy Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions. Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products.	
Unit 7:Environmental Protection From Unsustainable to Sustainable development. Environmental Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Population Growth and Human Health, Human Rights.	5 **Hrs.**

Textbooks:

1. Environmental Studies by Dr. P.D.Raut (Shivaji University, Kolhapur)

Reference Books:

1. Miller T.G. Jr., Environmental Science. Wadsworth Publications Co.(TB).
2. Odum, E.P.1971, Fundamentals of Ecology, W.B. Saunders Co. USA,574p
3. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. I and II, Environmental Media (R)

Unit wise Learning Outcomes:

At the end of the course the students will be able to:

UO 1: Describe scope and importance of environmental studies.
UO 2: Describe types of natural resources, their use and conservation.
UO 3: Explain structure and functions of ecosystem, their types and importance.
UO 4: Discuss biodiversity, endangered species and methods of biodiversity conservation.
UO 5: Explain causes, effects and solutions to pollution problems.
UO 6: Discuss environmental ethics and various social issues related to environment.
UO 7: Discuss laws and regulations for conservation of environment.

Course Code:	UAMPC0431	L	T	P	Credit
Course Name:	Object Oriented Programming Laboratory			2	1

Course Prerequsites:

Knowledge of any Programming language basics

Course Description:

This course is designed to develop Java programming expertise. Upon completion, students should be able to write programs in Java. Emphasis is on Class design, Implementation, File Handling, Exception Handling and Collection Framework

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Apply the fundamental concepts of object-oriented programming such as classes, objects, methods, and constructors to develop basic Java program	L3	Apply
CO2	Implement advanced object-oriented features such as inheritance, interfaces, and exception handling to solve real-world problems using Java.	L3	Apply
CO3	Develop Java application by applying OOP concepts	L6	Create

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	1	2	2		2				3	1	1	3	2	
CO2	1	2	2		3				3	1	1	3	2	
CO3	2	2	2	3	3				3	1	1	3	3	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation (ISE)	100%	Quiz/Assignments/Group Discussions/Internal oral
2	End Semester Examination (ESE)	100%	Assesment is based on practicle oral performance

Course Contents:

EXPERIMENT NO. 1		**2 Hours**
Latest Java Version Installation , Java IDE Installation		
EXPERIMENT NO. 2		**2 Hours**
Develop Java Program for multiple number functions and operations		
EXPERIMENT NO. 3		**2 Hours**
Develop Java Program to create Classes and Objects to perform methods on Object of Class		
EXPERIMENT NO. 4		**2 Hours**
Develop Java Program to access and test the functions of various Java Keywords		
EXPERIMENT NO. 5		**2 Hours**
Develop Java Program to demostrate use of Abstract Class and Abstract Methods		
EXPERIMENT NO. 6		**2 Hours**

Develop Java Program to demostrate use and implementation of Java Inheritance		
EXPERIMENT NO. 7		**2 Hours**
Develop Java Program to demostrate use and implementation of Java Inferfaces		
EXPERIMENT NO. 8		**2 Hours**
Develop Java Program to implement Java Exception Handling Mechanism		
EXPERIMENT NO. 9		**2 Hours**
Develop Java Program for various File Operations and methods		
EXPERIMENT NO. 10		**2 Hours**
Develop Java Program to implement various Input and OutPut streams		
EXPERIMENT NO. 11		**4 Hours**
Develop Java Program to Implement various Collection and Collection Methods		
EXPERIMENT NO. 12		**6 Hours**
Develop Java Application with real time Use Case Diagram, Class Diagram, OOP Concepts of Class, Inhertitance, Interface, Exception handling, File Handling , Package and Collection Framework		
Text Books:		
1.[CH] Cay S.Horstmann. Core Java Volume I - Fundamentals, Pearson 12th Edition 2023 2.[CH] Cay S.Horstmann. Core Java Volume II - Advanced Features, Pearson 12th Edition 2023		
Reference Books:		
1. [RN] R. Nageswara Rao. Core Java: An Integrated Approach, New: Includes All Versions upto Java 8 Jan 2025		
Web Resources:		
1. The Java Tutorials From ORACLE Java Documentation URL: http://docs.oracle.com/javase/tutorial/ 2. https://onlinecourses.nptel.ac.in/noc25_cs57/preview 3. https://www.jetbrains.com/idea/		

Course Code:	UAMPC0432	L	T	P	Credit
Course Name:	Data Analytics & Visualization Lab			2	1

Course Prerequsites:

Linear Algebra, Statistical and Probability Theory

Course Description:

This course focuses on the practical implementation of various statistical methods in the first few practical assignments. Later the focus is on learning the different visualization techniques using Python and PowerBi.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Illustrate the working of different statistical analysis methods.	L2	Understand
CO2	Make use of different visualization libraries to visualize real life data.	L3	Apply
CO3	Build dashboards on real life datasets using visualization tools such as PowerBI.	L6	Create

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1		1	1			1		
CO2	2	2	2	1	3	1	2	3	1	2		2	3	
CO3	2	3	1	2	3	1	2	3	1	2		2	3	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation (ISE)	100%	Quiz/ Mini-Project / Presentation/ Group Discussion/ Internal Oral (25 Marks)
2	End Semester Examination (OE)	100%	Assessment is based on practical-oral examination (25 Marks)

Course Contents:

EXPERIMENT NO. 1	Normal Distribution	2 Hours

a) Write a Python function generate_normal_data(mean, std_dev, size) that generates random numbers from a normal distribution with a given mean, standard deviation, and size.
b) Write a Python function calculate_statistics(data) that calculates the mean, standard deviation, median, minimum, and maximum of the given dataset.
c) Plot a histogram of the generated data to visualize its distribution.
d) Test your functions with different parameters and analyze the generated data statistically.

EXPERIMENT NO. 2	Poisson's Distribution	4 Hours

a) Write a Python function simulate_poisson_distribution(lambda_, size) that generates random numbers following a Poisson distribution with parameter lambda_, for a given size.
b) Write a Python function calculate_statistics(data) that calculates the mean, standard deviation, median, minimum, and maximum of the given dataset.
c) Plot a histogram of the generated data to visualize its distribution.
d) Test your functions with different parameters and analyze the generated data statistically.

EXPERIMENT NO. 3	Binomial Distribution	2 Hours
a) Write a Python function simulate_binomial_distribution(n, p, size) that generates random numbers following a binomial distribution with parameters n (number of trials) and p (probability of success), for a given size. b) Write a Python function calculate_statistics(data) that calculates the mean, standard deviation, median, minimum, and maximum of the given dataset. c) Plot a histogram of the generated data to visualize its distribution. d) Test your functions with different parameters and analyze the generated data statistically.		
EXPERIMENT NO. 4	**Correlation & Its Coefficient**	**2 Hours**
a) Write a Python function pearson_correlation(x, y) that calculates the Pearson correlation coefficient between two lists of numerical data, x and y. b) Write a Python function spearman_correlation(x, y) that calculates the Spearman correlation coefficient between two lists of numerical data, x and y.		
EXPERIMENT NO. 5	**Hypothesis Testing using t-test**	**2 Hours**
a) Write a Python function t_test(sample_data, population_mean, alpha) that performs a one-sample t-test on the given sample_data with a null hypothesis that the population mean is equal to population_mean. b) Implement the t-test formula to calculate the t-statistic and p-value. c) Determine whether to reject the null hypothesis based on the calculated p-value and significance level alpha. d) Print out the result of the hypothesis test along with the calculated t-statistic and p-value. e) Test your function with sample data.		
EXPERIMENT NO. 6	**Testing using Chi square Hypothesis -test**	**2 Hours**
a) Write a Python function chi-square_test(observed, expected) that performs a chi-square test on the given observed frequencies observed and expected frequencies expected. b) Implement the chi-square test formula to calculate the chi-square statistic and p-value. c) Determine whether to reject the null hypothesis based on the calculated p-value and significance level. d) Print out the result of the hypothesis test along with the calculated chi-square statistic and p-value. e) Test your function with sample data.		
EXPERIMENT NO. 7	**Visualizations using Python Programming**	**2 Hours**
Draw different visualizations such as – bar chart, histogram, pie chart, area chart, line chart, scatter plot, box plot etc. Using Mathplotlib library in Python.		
EXPERIMENT NO. 8	**Visualizations using Python Programming**	**4 Hours**
Draw different visualizations such as – bar chart, histogram, pie chart, area chart, line chart, scatter plot, box plot etc. Using Seaborn library in Python.		
EXPERIMENT NO. 9	**PowerBI Dashboard**	**2 Hours**
PowerBI charts. Include and Exclude. VIew Data and Export. Given a dataset, create a dashboard using PowerBI tool.		
EXPERIMENT NO. 10	**PowerBI Dashboard**	**4 Hours**

PowerBI- maps, matrics, tables, aggregating table, conditional formating, filter on visuals, hierarchies, totals and subtotals, number formatting Given a dataset, create a dashboard using PowerBI tool abd create a report and export it.		
EXPERIMENT NO. 11	**Tableau Dashboard**	**4 Hours**
Given a dataset, create a dashboard using Tableau tool.		
Text Books:		
1. Data Science from Scratch, Joel Grus, Oreilly Publications 2. Python for Data Visualization - A Beginner's Guide, Meta Brains, Packt Publishing 3. Beginning Data Science in R 4: Data Analysis, Visualization, and Modelling for the Data Scientist, Thomas Mailund, Apress Publications.		
Reference Books:		
Fundamentals of Mathematical statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand and Sons,		
Web Resources:		
1.Youtube channel (Edureka-PowerBi) - https://www.youtube.com/watch?v=hUacMEcLBKQ 2.Youtube channel (Pavan Lalwani-PowerBi) - https://www.youtube.com/watch?v=H84UJn1CiWo&list=PL6Omre3duO-		

Course Code:	UAMVS0433	L	T	P	Credit
Course Name:	AI & DS Tools Laboratory			2	1

Course Prerequsites:

Basic understanding of C, Python Programming.

Course Description:

This course provides a comprehensive introduction to object-oriented programming (OOP) concepts using C++ / Python and the practical applications of the NumPy and Pandas libraries for data manipulation and analysis. Via hands-on exercises, students will learn the fundamentals of OOP, NumPy, and pandas.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	**Apply** the principles and concepts of object-oriented programming	III	Apply
CO2	**Implement** a complex numerical problem by using appropriate NumPy functions.	VI	Create
CO3	**Implement** a complex manipulation problem by using appropriate Pandas functions.	VI	Create

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	3	2	1	1	1			2			2	2	3	
CO2	2	3	2	1	3			2			2	3	3	
CO3	2	3	2	1	3			2			2	3	3	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	100%	Quiz/Assignments/Internal oral
2	ESE(POE)	100%	Assesment is based on practicle oral performance

Course Contents:

EXPERIMENT NO. 1	Problem Solving	2 Hours

Assignment: Problem solving using C++ / Python. (Also design a Flow chart for given problems using RAPTOR Tool.)

Implement the following programs.

a. A program to find whether a given number is Armstrong / Strong/ Palindrome number or not.

b. To find the prime numbers between a given range

c. To display Fibonacci series upto nth trem

d. To find the factorial of a given number using recursion.

EXPERIMENT NO. 2	Class and Object	4 Hours

Assignment 1: Class and Object Basics
Create a class called Rectangle with attributes length and width.
Implement methods to calculate the area and perimeter of the rectangle.
Create instances of the Rectangle class and test the methods.
Assignment 2: Array of Object
Write a program to declare a class 'student' containing data members as 'r_no', 'name', 'age', 'subject marks_1', 'subject marks_2','subject marks_3'. Accept and calculate average & percentage. Display the grades for 5 students.
If marks > 90, grade = "A"
If marks > 75, grade = "B"
If marks > 50, grade = "C"
Otherwise, grade = "F"

EXPERIMENT NO. 3	**Inheritance & Polymorphism**	**2 Hours**

Assignment 1: Inheritance
Implement different types of inheritance for student information.
Single, Multiple, Multilevel, Hybrid, Hierarchical.
Assignment 2: Polymorphism- Compile time & Run time polymorphism.
Implement the concept of Method overloading & overriding.

EXPERIMENT NO. 4	**Encapsulation and Access Control ,Operator Overloading**	**2 Hours**

Assignment 1: Encapsulation and Access Control
Create a class BankAccount with private attributes like balance.
Implement methods to deposit, withdraw, and check balance, ensuring proper encapsulation.
Test the methods to ensure correct behavior and proper access control.
Assignment 2: Operator Overloading
Create a class Vector to represent a mathematical vector.
Implement methods to perform vector addition, subtraction, scalar multiplication, and dot product using operator overloading.
Test the vector operations with different instances of the Vector class.

EXPERIMENT NO. 5	**Exception Handling**	**2 Hours**

Assignment 1: Exception Handling
Write a program that takes two numbers as input from the user. Divide the first number by the second and print the result. Implement exception handling to catch and handle a ZeroDivisionError and ValueError.
Write a program to read a file specified by the user. Implement exception handling for the following scenarios:

EXPERIMENT NO. 6	**Data Abstraction**	**2 Hours**

Assignment: Data Abstraction
Create an abstract class Shape with an abstract method area.
Create subclasses Circle and Rectangle that inherit from Shape.
Implement the area method in both subclasses.
Write a function that takes a list of shapes and prints the area of each shape.

EXPERIMENT NO. 7	**Numpy Program-1**	**4 Hours**

Assignment 1: Execute the following operations using NumPy.
a. Write a program to perform basic matrix operations such as addition, subtraction, multiplication, and division using NumPy arrays.
b. Implement functions to calculate the determinant, inverse, and transpose of a matrix.

Assignment 2:
Creating 1D, 2 D, 3 D Array
reshape , flatten, ravel
Creating a 5-dimension array using ndmin.
Checking the dimension of the array using ndim.
Sorting the given array in ascending order.
Sorting the given array in Descending order.
Indexing and slicing of 1D, 2D, and 3D arrays.
linspace
random
eye , identity, ones, zeros
To find total size of the array
Size, itemsize , dtype

EXPERIMENT NO. 8	**Numpy Program-2**	**2 Hours**

Generate random data using NumPy arrays and perform statistical analysis. Calculate mean, median, mode, standard deviation, and variance of the data.

EXPERIMENT NO. 9	**Numpy Program-3**	**2 Hours**

Implement linear regression using NumPy to fit a line to a given set of data points.
Visualize the fitted line along with the data points.

EXPERIMENT NO. 10	**Pandas Program-1**	**4 Hours**

Assignment 1: Load a dataset (e.g., CSV or Excel file) using Pandas and perform data cleaning tasks such as handling missing values, removing duplicates, and converting data types. isnull(), notnull(), fillna(),replace(), interpolate(), dropna()

Assignment 2:

a. Execute the following Pandas functions on dataset**.**

head(), tail(), describe(), read_csv(), shape(), info()

b. indexing and slicing operation using loc & iloc function.

Fetching all Rows and Columns'

Fetching all Rows and some columns.

Fetching some Rows and all columns.

EXPERIMENT NO. 11	**Pandas Program-2**	**2 Hours**

Combine multiple datasets using Pandas' merge and join functions. Perform inner, outer, left, or right joins based on common keys.

Handle duplicate keys and missing values appropriately.

EXPERIMENT NO. 12	**Pandas Program-3**	**2 Hours**

Aggregate data using Pandas' pivot_table function to create summary tables. Calculate statistics for different groups and display results in a tabular format. Customize pivot tables by specifying aggregation functions and row/column indices.

Text Books:

1. "Python for data analysis ", Oreilly Publications , Wes Mckinney
2. "Python Feature Engineering Cookbook" by Soledad Galli - Packt Publication.
3. "Object-Oriented Python", Oreilly Publications, Irv Kalb, No Starch Press Publication

Reference Books:

1. The Object-Oriented Analysis and Design with Applications, 2007 Addison-Wesley (3rd Edition) by Grady Booch.
2. The C++ Programming Language, Addison-Wesley, 2013 Addison-Wesley (4th Edition) by Bjarne Stroustrup

Web Resources:

1. Udemy course on "Learn Python Libraries for Data Analysis & Data manipulation". - https://bit.ly/4k4kqE4
2. Udemy Course on "Python for Data Science: Numpy and Pandas Libraries for Data". - https://bit.ly/4kYbFgf
3. NPTEL Course on "Fundamentals of Object-Oriented Programming" By Prof. Balasubramanian Raman, IIT Roorkee. - https://onlinecourses.nptel.ac.in/noc25_cs34/preview

Course Code:	UAMIL0471	L	T	P	Credit
Course Name:	Mini Project-II			2	1

Course Prerequsites:

Knowledge of Project Based Learning (PBL) concepts.

Course Description:

In this mini project, the students will apply Project Based Learning to a multi-course environment for solving different real-world problems. The students shall use the concepts they have learned in their S.Y. B.Tech Program (SEM-III) & the courses they are learning in the current semester i.e. SEM-IV. Students will develop a solution to an identified problem.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Identify real world problems which can be solved using CS concepts and technologies.	L2	Understand
CO2	Describe the the proposed solution to the real world problem using technical report.	L2	Understand
CO3	Implement the proposed solution using Computer Science & Engineering techniques.	L3	Apply
CO4	Build detailed project report.	L3	Apply

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	2	3	1	1	2	0	0	0	0	0	2	2	0	
CO2	2	0	1	2	2	0	0	2	0	0	2	2	2	
CO3	2	2	3	2	2	2	3	3	2	2	3	3	3	
CO4	1	0	2	0	0	0	2	1	3	0	0	0	0	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE1	50%	In Semester Evaluation based on Progress of the project
2	ISE2	50%	In Semester Evaluation based on Progress of the project

Course Contents:

Guidelinesfor Mini Project-I

1 The primary objective of the mini project-I isto achieve multi course project based learning.

2 Course Instructorshall form the project team of 3 to 4 students in the batch of students

3 Each team shall use the knowledge they learned in the SY B.Tech courses to identify the real world problem which can be solved using technology

4 The solution shall be using the tools &techniquesfrom multiple courses- e.g a solution shall be using data structures, networking algorithm, Web Technology to develop mini project

5 As students have undertaken Fundamentals of Web - its recommended to develop user interface using HTML

6 The evaluation shall be done in two phases

Phase 1 ISE-1 In ISE 1 the studentsshall be graded based on the skills demonstrated to identify the problem statement, define the problem statement&Designing itssolution. The partial working model is expected to be completed.

Phase 2 ISE-2 In ISE 2 the studentsshall be graded based on the complete project implementation and its working. Followed by the detailed projectreport which shall cover the technical aspects of the project.

7 Itsrecommended to share a common projectreport formatto all batches.

8 All course instructors shall coordinate and work towards common evaluation process.

9 Course instructors shall demonstrate and discuss sample case studies with students to help them understand the mini project deliverables.

Department of _ CSE (AIML)Curriculum and Syllabus for B. Tech. CSE(AIML) Scheme: 2024-25 (As Per NEP)

Multi-Disciplinary Minor Courses (MM-II)

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	UAMMM0441	Biostatistics and Algorithms (MM-II)	3	-	-	3	3
2	UAMMM0442	Blockchain Technologies and FinTech (MM-II)	3	-	-	3	3
3	UAMMM0443	Microprocessor and Microcontrollers (MM-II)	3	-	-	3	3

Course Code:	UAMMM0441	L	T	P	Credit
Course Name:	Biostatistics and Algorithms	3			3

Course Prerequsites:

A basic foundation in linear algebra, discrete mathematics, probability and statistics, and data structures ML, DL.

Course Description:

The course is designed to provide students with a comprehensive understanding of the fundamental principles of biostatistics and their applications in the field of public health.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Describe the fundamentals, architecture, and evolution of microprocessors and microcontrollers.	L2	Understand
CO2	Apply and interpret statistical methods and regression models in predictive modeling and AI/ML experiments	L3	Apply
CO3	Analyze the role of biostatistics in public health, instrumentation, and medical informatics.	L4	Analysis
CO4	Analyse case studies using biostatistical tools to address real-world AI/ML and healthcare problems.	L3	Apply

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	2	2										2		
CO2	2	2	2	2								2	2	
CO3	2	2		3								2	2	
CO4	2	2	2	2								2	2	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	--	--
2	Mid Semester Examination (MSE)	--	--
3	In Semester Evaluation 2 (ISE2)	--	--
4	End Semester Examination (ESE)	100%	100% course contents

Course Contents:

UNIT 1	Introduction	8 Hours

Overview of biostatistics and its applications in computer science and AI/ML,Basic concepts: data types, variables, and measures of central tendency and dispersion,Probability distributions and their significance in analyzing biological data,Introduction to hypothesis testing and its relevance in biological research

UNIT 2	Statistical Methods and Algorithms for Biostatistics	8 Hours

Overview of statistical methods commonly used in AI/ML applications, Regression analysis: linear regression, logistic regression, and their applications in predictive modeling, Analysis of variance (ANOVA) and its role in comparing multiple groups or treatments, Basics of experimental design and its importance in designing AI/ML experiments.

UNIT 3	Limitations and Misinterpretations of Biostatistics	8 Hours

The roles biostatistics serves in the discipline of public health, statistical analyses found in public health studies,basic informatics techniques with vital statistics and public health records

UNIT 4	Biostatistics in Public Health	7 Hours
Overview of public health programs with biostatistics principles and methodologies to collect, analyze use, and present data, health related applications and contributions to biostatistics concepts Case studies demonstrating the application of biostatistics and algorithms in AI/ML		
UNIT 5	**Advanced Topics in Biostatistics and AI Integration**	**7 Hours**
Survival analysis and time-to-event data in public health, Bayesian statistics in AI/ML-based health predictions, Use of unsupervised learning (clustering, PCA) in public health datasets,Ethical considerations and data privacy in biostatistical AI applications		
UNIT 6	**Case Studies**	**7 Hours**
Case studies demonstrating the application of biostatistics and algorithms in AI/ML		
Text Books:		
1. Pandey M. (2015): Biostatistics-Basic and Advanced-MV Learning.		
Reference Books:		
1.Larry Pace (2012), Beginning R: An Introduction to Statistical Programming 2. Cinlar E. (1975).Introduction to Stochastic Process.Prentice Hall.		
Web Resources:		
1. Biostatistics and Design of Experiments https://nptel.ac.in/courses/111/105/111105041 2. Biostatistics in Public Health Specialization https://www.coursera.org/specializations/biostatistics-public-health		

Course Code:	UAMMM0442	L	T	P	Credit
Course Name:	Blockchain Technologies and FinTech	3			3

Course Prerequsites:

Basic understanding of computer science and financial concepts

Course Description:

Gain foundational knowledge of blockchain technology and cryptocurrency, enabling understanding of their applications, limitations, and potential impact in various industries.

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Understand decentralized systems and describe core blockchain concepts, architecture, and trust mechanisms.	L2	Understand
CO2	Apply cryptographic techniques and evaluate their role in ensuring blockchain security	L3	Apply
CO3	Analyze major blockchain platforms and consensus mechanisms for enterprise and	L4	Anlaysis
CO4	Summarize the limitations, opportunities, and challenges in Blockchain.	L2	Understand

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	2	2	2		2						2	2		
CO2	2	2			2						2	2	2	
CO3	2	2		2	2						2	2	2	
CO4	2	2	2	2	2						2	2	2	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	--	--
2	Mid Semester Examination (MSE)	--	--
3	In Semester Evaluation 2 (ISE2)	--	--
4	End Semester Examination (ESE)	100%	100% course contents

Course Contents:

UNIT 1	Introduction to Blockchain Technology	8 Hours

Understanding the Need for Decentralized Ledger Systems,Exploring Centralized vs. Decentralized Systems: Advantages and Disadvantages,Security, Integrity, and Privacy Issues in Decentralized Systems,Overview of Blockchain Technology and Its Trust Mechanisms

UNIT 2	Fundamentals of Cryptography in Blockchain	8 Hours

Introduction to Public and Private Keys,Basics of Digital Signatures and Hash Values,Real-life Challenges and Applications of Cryptographic Elements,Ensuring Privacy and Security in Blockchain Transactions,

UNIT 3	Overview of Blockchain Platforms	8 Hours

Classification of Blockchain Platforms: Perspectives and Major Platforms,Introduction to Ethereum and Its Role in FinTech,Understanding Trustlessness, Immutability, and Consensus Mechanisms

UNIT 4	Applications of Blockchain Technology	7 Hours

Tokenization and Fundraising on Blockchain Platforms,Use Cases: Blockchain in Trade Finance, Supply Chain Financing, and Cross-Border Connectivity,Blockchain in Enterprise: Coordination and Decision Making		
UNIT 5	**Limitations, Opportunities, and Challenges of Blockchain**	**7 Hours**
Selection Criteria for Blockchain Applications: Key Factors and Best Fit,Benefits of Permissioned Blockchains in Enterprise Networks,Opportunities and Risks of Smart Contracts in Enterprise Applications		
UNIT 6	**Understanding Blockchain Risks and Sectoral Applications**	**7 Hours**
Understanding the Limitations and Risks of Blockchain Technology,Exploring Security Risks and Privacy Concerns,Use Cases: Blockchain in Health Insurance, PropTech, Banking, and Healthcare Industries Institutional Investment Opportunities in the Digital Asset Space		
Text Books:		
1. "Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications" by Imran Bashir 2. BlockChain Technology :Algorithms and application by Asharaf S 3. Mastering Blockchain by Lorne Lantz, Daniel Cawre		
Reference Books:		
1. "Blockchain: Blueprint for a New Economy" by Melanie Swan		
Web Resources:		
1. MIT – Blockchain Technology (edX) https://www.edx.org/course/blockchain-technology 2. nptel Introduction to Blockchain Technology (IIT Kharagpur) https://nptel.ac.in/courses/106/105/106105184/		

Course Code:	UAMMM0443	L	T	P	Credit
Course Name:	Microprocessor and Microcontroller	3			3

Course Prerequsites:

Fundamentals of Digital Electronics

Course Description:

This syllabus covers the fundamental concepts, architectures, programming, interfacing, and applications of microprocessors and microcontrollers, providing students with both theoretical knowledge and practical skills essential for working in the field of embedded systems and related areas

Course Outcomes:	After the completion of the course the student will be able to -	BL	Description
CO1	Describe the fundamentals, architecture, and evolution of microprocessors and microcontrollers.	L2	Understand
CO2	Develop assembly and C programs for 8085, 8086, and PIC microcontrollers.	L3	Apply
CO3	Analyze interfacing techniques for memory, I/O devices, sensors, and actuators using communication protocols.	L4	Analysis
CO4	Design embedded system applications using microcontrollers in areas like IoT, robotics, and biomedical fields	L3	Apply

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	2	2									2	2		
CO2	2	2	2								2	2	2	
CO3	2	2		2							2	2	2	
CO4	2	2	2	3							2	2	2	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	--	--
2	Mid Semester Examination (MSE)	--	--
3	In Semester Evaluation 2 (ISE2)	--	--
4	End Semester Examination (ESE)	100%	100% course contents

Course Contents:

UNIT 1	Introduction to Microprocessors and Microcontrollers	8 Hours

Overview of microprocessors and microcontrollers,Evolution and history,Basic architecture and components

UNIT 2	8085 Microprocessor	8 Hours

Architecture and pin diagram,Instruction set and programming,Addressing modes, Interfacing with memory and I/O devices

UNIT 3	8086 Microprocessor	8 Hours

Architecture and pin diagram ,Instruction set and programming (including assembly language),Memory segmentation,Interfacing with memory and I/O devices

UNIT 4	Pentium Microprocessor	7 Hours

Pentium Architecture, Internal Block Diagram and Functional Units, Pipelining and Branch Prediction Logic, Memory Organization in Pentium

UNIT 5	**PIC Microcontrollers**	**7 Hours**
Introduction to PIC architecture,Programming in assembly and C.Peripheral interfacing		
UNIT 6	**Interfacing and Applications**	**7 Hours**
Interfacing with sensors and actuators,Communication protocols (UART, SPI, I2C),Interrupts and timers,,Applications in embedded systems, robotics, IoT, etc.		
Text Books:		
1. "Microprocessor Architecture, Programming, and Applications with the 8085" by Ramesh S. Gaonkar - 2."PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18" by Muhammad Ali Mazidi, Rolin D. McKinlay, and Danny Causey		
Reference Books:		
1."The 8086 Microprocessor: Programming and Interfacing the PC" by Kenneth J. Ayala - 2. Programming PIC Microcontrollers with XC8" by Armstrong Subero		
Web Resources:		
1. “Microprocessors and Microcontrollers” (NPTEL, IIT Kharagpur) https://onlinecourses.nptel.ac.in/noc22_ee12 2. Computer Architecture and Organization Comprehensive Course https://www.udemy.com/course/computer-architecture-and-organization/		