

Sheth T. J. Education Society's
Sheth N.K.T.T College of Commerce and
Sheth J.T.T College of Arts (AUTONOMOUS), Thane (W)
S.Y.B.Sc. (AI & ML) 2026-27

	Semester III	Credits		Semester IV	Credits
Major			Major		
BAID301	Data Mining	2	BAIB401	Big Data Analytics	2
BAIDP302	Data Mining Practical	2	BAIBP402	Big Data Analytics Practical	2
BAIF303	Fundamentals of Artificial Intelligence	2	BAIM403	Machine Learning	2
BAIFP304	Fundamentals of Artificial Intelligence Practical	2	BAIMP404	Machine Learning Practical	2
Minor			Minor		
BAIP305	Data Structure & Algorithm using Python	2	BAID405	Data Analysis & Visualization	2
BAIPP306	Data Structure & Algorithm using Python Practical	2	BAIDP406	Data Analysis & Visualization Practical	2
OE			OE		
BAIR307	Research Methodology	2	BAIF407	Fuzzy Logic	2
BAIL308	Linear Algebra	2	BAIT408	Testing of Hypothesis	2
BAIE309	Fundamentals Of Digital Electronics	2	BAIE409	Econometrics	2
VSC			SEC		
BAIRP310	R Programming	2	BAIW410	Web Development	2
AEC			AEC		
BAIH311/ BAIM311	Hindi/Marathi	2	BAIH411/ BAIM411	Hindi/ Marathi	2
FP			CEP		
BAIFP312	FP	2	BAICE412	CEP	2
CC			CC		
BAIN313/ BAIY313	NSS/ Sports/ Cultural/ Yoga	2	BAIN413/ BAIY413	NSS/ Sports/ Cultural/ Yoga	2
	Total	22			22

Dr. Yogeshwari Patil
Department Coordinator

Prof. Heena Chande
NEP Coordinator

Dr. Dilip Patil
Principal

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Syllabus: NEP 2020 w.e.f 2026-27

Programme Name: B.Sc(AI & ML)		Semester:III
Course Category: Major		
Name of the Dept: Science & Technology		
Course Title: Data Mining		
Course Code: BAID301		Course Level:4.5
Type : Theory		
Course Credit: 02		
Hours Allotted: 30 Hours		
Marks Allotted: 50 Marks		
Course Objectives : 1. To understand data warehouse with architectural types, architectural building blocks, aggregate tables and data mining classification. 2. To learn basics of unsupervised learning clustering & association rule use of various data mining algorithms		
Course Outcomes : After the completion of the course, the learners would be able to: CO1: demonstrate knowledge of data warehouse with clear understanding of architectural types & Data mining techniques for classification. CO2: gain knowledge of using various Data Mining techniques for unsupervised learning clustering & association rule for analyzing the datasets using tools like Weka , R or Python		
Description of the course:		Introduction, relevance, Usefulness, Application, interest, connection with other courses, demand in the industry, job prospects etc.

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Unit No.	Content	Hours
I	DATA WAREHOUSE: The Building Blocks: Defining Features, Data Warehouses and Data Marts, Architectural Types, Overview of The Components, Metadata in The Data Warehouse DIMENSION MODELLING: The Star Schema, keys, The Snowflake Schema, Aggregate Fact Tables INTRODUCTION TO DATA MINING: Introduction, Data Mining Applications, Data Mining Process, Data Mining Techniques BEGINNING WITH WEKA AND IRIS DATASET IN R: Understanding Fisher's Iris Flower Dataset CLASSIFICATION: Introduction to Classification, Types of Classification, Input and Output, , Introduction to the Decision Tree Classifier, Naive Bayes Method, Understanding Metrics to Assess the Quality of Classifiers	15
II	CLUSTER ANALYSIS: Introduction to Cluster Analysis, Applications of Cluster Analysis, Partitioning Clustering, Hierarchical Clustering, Introduction to Modern Search Engines, Working of a Search Engine, PageRank Algorithm, Precision and Recall INTRODUCTION TO ASSOCIATION RULE MINING: : Defining Association Rule Mining, Representations of Items for Association Mining THE APRIORI ALGORITHM: The Apriori-TID Algorithm for Generating Association Mining Rules Direct Hashing and Pruning (DHP), Dynamic Itemset Counting (DIC), Mining Frequent Patterns without Candidate Generation (FP Growth)	15
	Total Hours	30

References:

1. "DATA WAREHOUSING FUNDAMENTALS FOR IT PROFESSIONALS " by PAULRAJ PONNIAH of "Wiley Second edition 2010"
2. "Data Mining and Data Warehousing : Principles and Practical Techniques" by Parteek Bhatia Cambridge University Press First 2019
4. "Data Mining and Data Warehousing" by S.K. Mourya Shalu Gupta published "Alpha Science International Ltd First edition 2013"

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Programme Name: B.Sc(AI & ML)		Semester:III
Course Category: Major		
Name of the Dept: Science & Technology		
Course Title: Data Mining Practical		
Course Code: BAIDP302		Course Level:4.5
Type: Practical		
Course Credit: 02		
Hours Allotted: 60 Hours		
Marks Allotted: 50 Marks		
Course Objectives: 1. To understand data warehouse with architectural types, architectural building blocks, aggregate tables and data mining classification. 2. To learn basics of unsupervised learning clustering & association rule use of various data mining algorithms		
Course Outcomes: After the completion of the course, the learners would be able to: CO1: demonstrate knowledge of data warehouse with clear understanding of architectural types & Data mining techniques for classification. CO2: gain knowledge of using various Data Mining techniques for unsupervised learning clustering & association rule for analyzing the datasets using tools like Weka or R		
Description of the course:	This course introduces the fundamentals of data warehousing and data mining . It covers data warehouse architecture, key components, and aggregate tables, along with classification techniques. The course also focuses on unsupervised learning methods such as clustering and association rule mining. Students gain hands-on experience using tools like Weka and R to analyze datasets and support data-driven decision-making.	

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Sr. No.	Content (List of Practicals)	Hours
1	Performing classification on data sets using Weka.	
a	Building a Decision Tree Classifier in Weka	
b	Applying Naïve Bayes on Dataset for classification	
2	Performing classification on data sets using R.	
a	Decision Tree Operation with R	
b	Naïve Bayes Operation using R	
3	Implementing Apriori Algorithm with R and Weka	
a	Applying the Apriori Algorithm in Weka on a Real-World Dataset	
b	Applying the Apriori Algorithm on a Numeric Dataset	
4	Implementing Clustering with Weka.	
a	Clustering Fisher 's Iris Dataset with the Simple k-Means Algorithm	
b	Results Analysis after Applying Clustering	
5	Implementing Clustering with R.	
a	Clustering in R using Simple k-Means	
b	Clustering in R using Simple k-Means on numeric dataset.	
6	Implementing Association Mining with R.	
a	Applying Association Mining in R	
b	Application of Association Mining on Numeric Data in R	
7	Implementing Association Mining with Weka.	
A	Perform Association technique on Agriculture dataset.	
b	Perform Association technique on Weather dataset.	
8	Web Mining	
a	Implement Hyperlink Induced Topic Search (HITS) algorithm	
b	Implement PageRank Algorithm	
	Total Hours	60

References:

1. "DATA WAREHOUSING FUNDAMENTALS FOR IT PROFESSIONALS " by PAULRAJ PONNIAH of "Wiley Second edition 2010"
2. "Data Mining and Data Warehousing : Principles and Practical Techniques" by Parteek Bhatia Cambridge University Press First 2019
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Programme Name: B.Sc. (AI and ML)		Semester: III
Course Category: Major		
Name of the Dept.: Science & technology		
Course Title: Fundamentals of Artificial Intelligence		
Course Code: BAIF303		Course Level:4.5
Course Credit: 2		
Hours Allotted: 30 Hours		Total Marks: 50 Marks
Course Objectives: 1. Comprehensive understanding of intelligent systems, AI problem-solving techniques, search algorithms, and the development of intelligent agents using various search methods and reasoning strategies. 2. To explore uncertainty reasoning, probabilistic models like Bayesian networks, and machine learning techniques, including supervised learning, decision trees, neural networks, and deep learning for solving real-world problems		
Course Outcomes: After the completion of the course, the learners would be able to: CO1: design and implement intelligent agents, apply various search techniques, and formulate AI problems effectively to solve complex challenges using both uninformed and informed search strategies. CO2: effectively apply uncertainty reasoning and advanced machine learning techniques, including probabilistic models, decision trees, neural networks, and deep learning, to solve complex real-world problems.		
Description of the course:		This course introduces the fundamentals of Artificial Intelligence (AI), focusing on intelligent agents, problem-solving techniques, and search algorithms. It covers uninformed and informed search methods, uncertainty reasoning using Bayesian networks, and key machine learning concepts like decision trees, neural networks, and support vector machines. Students will learn to apply these techniques in real-world AI applications. The course emphasizes both theoretical understanding and practical implementation.

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Unit No.	Content	Hours
I	Intelligent Systems and Intelligent Agents: Introduction to AI, AI Problems and AI techniques, Solving problems by searching, Problem Formulation. State Space Representation Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent. Searching Techniques: Uninformed Search: DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening. Informed Search: Heuristic functions, Hill Climbing, Simulated Annealing, Best First Search, A*	15
II	Uncertainty and Reasoning: Uncertainty, Representing Knowledge in an Uncertain Domain, Bayesian Network, Conditional Probability, Joint Probability, Bayes' theorem, Belief Networks Machine Learning: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Support Vector Machines, Introduction to deep learning.	15
	Total Hours	30

References:

Sr. No	Title	Author	Publisher	Edition	Year
1.	Artificial Intelligence: A Modern Approach	Stuart J. Russell and Peter Norvig	Pearson	Fourth Edition	2020
2.	Artificial Intelligence: Foundations of Computational Agents	David L Poole, Alan K. Mackworth	Cambridge University Press	Second Edition	

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Programme Name: B.Sc (AI and ML)		Semester: III
Course Category: Major		
Name of the Dept: Science and Technology		
Course Title: Fundamentals of Artificial Intelligence Practical		
Course Code: BAIFP304		Course Level: 4.5
Course Credit: 02		
Total Hours: 60 Hours		
Total Marks: 50 Marks		
Course Objectives: 1. To teach students how to implement search algorithms and AI techniques to solve problems like the Water Jug Problem, N-Queen, and machine learning tasks such as decision trees and classification. 2. To provide practical experience in applying AI algorithms and creating PL/SQL triggers and packages for efficient problem-solving and database management.		
Course Outcomes: After the completion of the course, the learners would be able to: CO1: implement various search algorithms and AI techniques to solve complex problems and optimize solutions in real-world scenarios. CO2: gain practical skills in machine learning, decision trees, and PL/SQL, enabling them to build intelligent systems and manage databases effectively.		
Description of the Course:		This course focuses on advanced AI techniques and algorithms, emphasizing search strategies, problem-solving, and decision-making. Students will learn and implement both uninformed and informed search algorithms like DFS, BFS, Hill Climbing, and A*. The course also covers machine learning techniques, including linear regression, classification, and decision trees, along with game theory concepts like Alpha-Beta pruning. Practical applications include solving classic AI problems like the N-Queens, map coloring, and the water jug problem. By the end, students will be equipped with the tools to apply AI in real-world scenarios and optimization problems.

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Sr No.	Content(List of Practicals)	Hours
1	Generate the state-space possibilities for the following problems a. Water jug problem b. Number puzzle	
2	Write the program to compute the following Uninformed Search Algorithms for suitable problem a. Depth First Search b. Breadth First Search	
3	Write the program to compute the following Informed Search Algorithms for suitable problem a. Hill Climbing b. Simulated Annealing c. A* algorithm	
4	Write the program to compute the following Algorithms for suitable problem a. Simulate solution for 4-Queen / N-Queen problem b. Constraint satisfaction problem: Map Coloring	
5	Write the program to compute the following Search Algorithms for suitable problem a. Alpha Beta Pruning b. Water jug problem	
6	Write the program to compute the following Algorithms for suitable problem a. Simple Inferencing	
7	Write the program to compute the following Algorithms for suitable problem a. Linear Regression b. Classification problem	
8	Write the program to implement decision tree for suitable problem. a. Two Class decision b. Multi Class decision	
	Total Hours	60

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Syllabus: NEP 2020 w.e.f 2026-27

Programme Name: B.Sc (AI and ML)		SEMESTER III
Course Category: Minor		
Name of the dept.: Science and Technology		
Course Title: Data Structure and Algorithm Using Python		
Course Code: BAIP305	Course Level:4.5	
Type: Theory		
Course Credit: 02		
Hours Allotted: 30 Hours		
Marks Allotted: 50 Marks		
Course Objectives: 1. To learn the significant Python implementation of popular data structures. 2. To learn about various data structure algorithms and design paradigms.		
Course Outcomes: After the completion of the course, the learners would be able to: CO1: choose appropriate data structure in Python for specified Problems and algorithms. CO2: implement Linked list, Stack, Queue, Tree data structure and various sorting algorithms.		
Description of the course:	Data Structures and Algorithms using Python covers the fundamental concepts of organizing and manipulating data efficiently. This subject explores various data structures like linked lists, stacks, queues, trees, along with essential algorithms for searching, sorting, and optimization. By applying these concepts in Python, students learn to design and analyze solutions to real-world computational problems with an emphasis on performance and scalability.	

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Unit No.	Content	Hours
I	Python Objects & Object-Oriented Programming: Classes and object programming, Class Definitions, Inheritance, Data encapsulation and properties, Namespaces and Object-Orientation. Principles of Algorithm Design: An introduction to algorithms, Algorithm design paradigms Recursion and backtracking, Backtracking, Divide and conquer - long multiplication The recursive approach Runtime analysis Asymptotic analysis Big O notation, Composing complexity classes Omega notation, Theta notation, Amortized analysis. Lists and Pointer Structures: Arrays-Pointer structures Singly linked lists-Singly linked list class, The append operation, A faster append operation, Getting the size of the list, Improving list traversal, Deleting nodes, List search, Clearing a list Doubly and circular linked lists-A doubly linked list node Doubly linked list class, creating a circular list.	15
II	Stacks: Stack implementation, Push operation, Pop operation, Peek operation, Bracket-matching application. Queues: List-based queues, Stack-based queues Node-based queues, Application of queues Media player queues Trees: Terminology, Tree nodes, Tree traversal, Depth-first traversal-In-order traversal and infix notation, Pre-order traversal and prefix notation, Post-order traversal and postfix notation, Breadth-first traversal. Binary trees-Binary search trees, Binary search tree Implementation, Binary search tree operations, Finding the minimum and maximum nodes Inserting nodes Deleting nodes. Sorting: Sorting algorithms- Bubble sort algorithms, Insertion sort algorithms, Selection sort algorithms, Quick sort algorithms	15
	Total Hours	30

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Programme Name: B.Sc (AI and ML)		Semester: III
Course Category: Minor		
Name of the Dept.: Science and Technology		
Course Title: Data Structure and Algorithm Using Python Practical		
Course Code: BAIPP306		Course Level: 4.5
Type: Practical		
Course Credit: 2 credits		
Hours Allotted: 60 Hours		
Marks Allotted: 50 Marks		
Course Objectives: 1. To provide students with hands-on experience in implementing and applying various data structures and algorithms. 2. students will gain proficiency in designing efficient solutions for real-world computational problems, understanding time and space complexities, and optimizing code performance.		
Course Outcomes: After the completion of the course, the learners would be able to: CO 1. implement and manipulate various data structures (linked lists, stacks, queues using Python. CO2. apply different algorithms for searching, sorting, and tree traversal to solve practical problems.		
Description of the course:	Data Structure and Algorithm using Python practical course offers students the opportunity to implement and experiment with various data structures and algorithms in Python. Through hands-on coding exercises, students will strengthen their understanding of key concepts such as searching, sorting, and optimizing algorithms while developing problem-solving skills in real-world scenarios.	

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Sr. No.	Content(List of Practicals)	Hours
1	Write Python Program to demonstrate OOP Concepts including Class, Objects, Inheritance and encapsulation.	
2	a. Write Python Program to create singly linked list and various operations on it. b. Write Python Program to create doubly linked list. c. Write Python Program to create circular linked list.	
3	Write Python Program to implement stack and demonstrate push, pop and peek operations.	
4	a. Write Python Program to implement list based queues and demonstrate various operations on it. b. Write Python Program to implement stack based queues and demonstrate various operations on it.	
5	Write Python Program to implement Node based queues and demonstrate various operations on it.	
6	a. Write Python Program to implement tree data structure and demonstrate depth first traversal. b. Write Python Program to implement tree data structure and demonstrate breadth first traversal.	
7	a. Write Python Program to implement binary search tree to find the minimum node. b. Write Python Program to implement binary search tree to find the maximum node.	
8	a. Write a Python implementation to demonstrate the insert and delete method to add/delete the nodes in the BST. b. Python implementation to search the node in the BST.	
9	a. Write a Python Program for implementing Insertion Sort. b. Write a Python Program for implementing Bubble Sort. c. Write a Python Program for implementing Quick Sort. d. Write a Python Program for implementing Selection Sort.	
	Total hours	30

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Programme Name: B.Sc (AI and ML)		Semester: III
Course Category/Vertical: Open Elective		
Name of the Dept: Science and Technology		
Course Title: Research Methodology		
Course Code: BAIR307		Course Level: 4.5
Type: Theory		
Course Credit: 2 credits		
Hours Allotted: 30 Hours		
Marks Allotted: 50 Marks		
Course Objectives: 1. To impart analytical skill in solving complex problems and to foster the ability to critically think in developing robust, extensible and highly maintainable solutions to simple and complex problems. 2. To explore the unknown and unlock new possibilities in different dimensions of the System and to portray accurately the characteristics of a particular individual, situation or a group under study.		
Course Outcomes: After the completion of the course, the learners would be able to: CO1: understands the reasons for doing research, the applications of research, characteristics and requirements of the research process, types of research and Research paradigms and also applying major approaches to information gathering, the relationship between attitudinal and measurement scales Methods for exploring attitudes in research. CO2: analyze data in qualitative and quantitative studies, write a research report and use application of AI and ML in data analysis & Research		
Description of the course:	Research methodology is a systematic framework that outlines the techniques and procedures used to conduct research, ensuring the study remains objective and unbiased, and allows readers to evaluate the validity and reliability of the research.	

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Unit No.	Content	Hours
I	Research Methodology-An Introduction: Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India. Defining the Research Problem: Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs. Sampling Design: Census and Sample Survey, Implications of a Sample Design, Steps in Sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs, How to Select a Random Sample? Random Sample from an Infinite Universe, Complex Random Sampling Designs Methods of Data Collection: Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Difference between Questionnaires and Schedules, Some Other Methods of Data Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method,	15
II	Processing and Analysis of Data: Processing Operations, Some Problems in Processing, Elements/Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion, Measures of Asymmetry (Skewness), Measures of Relationship, Simple Regression Analysis, Multiple Correlation and Regression, Partial Correlation, Association in Case of Attributes, Other Measures, Summary Chart Concerning Analysis of Data Sampling Fundamentals: Need for Sampling, Some Fundamental Definitions, Important Sampling Distributions, Central Limit Theorem, Sampling Theory, Sandler's A-test, Concept of Standard Error, Estimation, Estimating the Population Mean (μ), Estimating Population Proportion, Sample Size and its Determination, Determination of Sample Size through the Approach Based on Precision Rate and Confidence Level, Determination of Sample Size through the Approach, Based on Bayesian Statistics Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish? UGC-CARE, Web of Science, SCOPUS, IEEE, ACM, Ethical issues related to publishing, Copyright, Data Privacy, Plagiarism and Self-Plagiarism, Software for detection of Plagiarism. ShodhShudhhi (PDS), smallseotools.com	15
	Total Hours	30

Books and References:

Sr. No	Title	Author/s	Publisher	Edition
1.	Research Methodology – Methods and techniques	C. R. Kothari	New Age International (P) Ltd., Publishers	---
2.	Business Research Methods	Donald R. Cooper Pamela Schindler	McGraw- Hill/Irwin	McGraw - Hill/Irwin
3.	Business Research Methods	Allan Bryman Emma Bell	OXFORD University Press	---
4.	Research Methods for Business Students	Mark Saunders Philip Lewis Adrian Thornhill	Pearson Education Limited	---

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Programme Name: S.Y.BSc (AI & ML)		Semester: III
Course Category/Vertical: OE		
Name of the Dept: Artificial Intelligence and Machine Learning		
Course Title: Linear Algebra		
Course Code: BAIL308		Course Level:4.5
Type: Theory		
Course Credit: 2		
Hours Allotted: 30 Hours		
Marks Allotted: 50 Marks		
Course Objectives: 1. To develop a strong foundation in matrices, Gaussian elimination, vector spaces, linear transformations, and orthogonality, enabling students to understand and apply linear algebra techniques for solving systems of linear equations and representing data in high-dimensional spaces used in Artificial Intelligence and Machine Learning. 2. To equip students with knowledge of determinants, eigenvalues, eigenvectors, and matrix decompositions, enabling them to apply these concepts in machine learning algorithms, dimensionality reduction techniques, and optimization problems used in AI systems.		
Course Outcomes: After the completion of the course, the learners would be able to: CO1. perform matrix operations, solve systems of linear equations using Gaussian elimination, analyze vector spaces, and apply orthogonality and projection techniques for solving problems related to data representation and analysis in AI and ML. CO2. analyze matrix properties, compute eigenvalues, eigenvectors, and singular value decomposition (SVD), and apply these techniques in machine learning models, neural networks, data compression, and optimization algorithms used in artificial intelligence.		
Description of the course:		This course provides a strong foundation in linear algebra with a focus on applications in Artificial Intelligence and Machine Learning. It introduces key mathematical concepts such as matrices, vector spaces, orthogonality, determinants, eigenvalues, eigenvectors, and singular value decomposition (SVD). These concepts play a critical role in many AI and ML techniques including data representation, dimensionality reduction, optimization, and model training. By the end of the course, students will develop the mathematical understanding required to analyze and implement machine learning algorithms, perform data transformations, and understand the theoretical foundations behind AI models.

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Unit No.	Content	Hours
I	Matrices and Gaussian Elimination: Introduction, The Geometry of Linear Equations, An Example of Gaussian Elimination, Matrix Notation and Matrix Multiplication, Triangular Factors and Row Exchanges, Inverses and Transposes, Special Matrices and Applications. Vector Spaces: Vector Spaces and Subspaces, Solving $Ax=0$ and $Ax=b$, Linear Independence, Basis, and Dimension, Linear Transformations. Orthogonality: Orthogonal Vectors and Subspaces, Cosines and Projections onto Lines, Projections and Least Squares, Orthogonal Bases and Gram-Schmidt, The Fast Fourier Transform.	15
II	Determinants: Introduction, Properties of the Determinant, Formulas for the Determinant, Applications of Determinants. Eigenvalues and Eigenvectors: Introduction, Diagonalization of a Matrix, Complex Matrices, Similarity Transformations. Positive Definite Matrices: Minima, Maxima, and Saddle Points, Tests for Positive Definiteness, Singular Value Decomposition, Minimum Principles, The Finite Element Method.	15
	Total Hours	30

References:

Sr. No.	Title	Author/s	Publisher	Edition
1	Linear Algebra and Its Applications	Gilbert Strang	Cengage Publication	Fourth Edition
2	Advanced Linear Algebra	David Surowski		
3	Linear Algebra, Theory and Applications	Kenneth Kuttlet		

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Programme Name: B.Sc. (AL & ML)		Semester: III
Course Category: Open Elective		
Name of the Dept: Science & Technology		
Course Title: Fundamentals of Digital Electronics		
Course Code: BAIE309		Course Level:4.5
Course Credit: 2		
Hours Allotted: 30 Hours		Total Marks:50 Marks
Course Objectives: 1. To understand the basic concepts of digital electronics and logic design. 2. To relate digital electronics fundamentals with computing systems used in AI & ML applications.		
Course Outcomes: After the completion of the course, the learners would be able to: CO1: apply number systems, Boolean algebra, and logic gates to design and simplify basic digital circuits. CO2: analyze combinational and sequential circuits and relate their applications to computing systems used in AI and ML.		
Description of the course:		This course introduces the fundamental concepts of digital electronics required for understanding modern computing systems. It covers number systems, Boolean algebra, logic gates, combinational and sequential circuits. The course builds foundational knowledge of digital hardware that supports processors, memory systems, and AI-based computing architectures.

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Unit No.	Content	Hours
I	Introduction to Digital Electronics and Number System Analog vs Digital systems, Advantages of digital systems, Applications of digital electronics in computing and AI systems, Introduction to Number systems, Positional Number systems, Conversions (converting between bases), non-positional number systems, 1's complement and 2's complement Logic Gate and Logic Circuits Basic Gates, Universal Gates, Exclusive Gates Boolean Algebra and Gate Level Minimization Introduction, Postulates of Boolean Algebra, Two valued Boolean Algebra, SOP & POS forms, Principle of Duality, De Morgans Laws, Boolean Functions and their Representation, K-Map, Simplification of Boolean expressions	15
II	Combinational Circuits Introduction to Combinational Logic, Types of Combinational Circuit: Half and Full Adder, Half and Full Subtractor, Multiplexer and Demultiplexer, Encoder and Decoder. Sequential Circuits Introduction to Combinational Circuits, Flip-Flops (SR, JK, D, T), Registers and its types, Counters and its types. Applications in Computing & AI Hardware Digital logic in processors and AI chips, Binary data representation in AI systems, Memory systems for AI data, Digital circuits in IoT and embedded AI, Applications in robotics, smart systems, and automation.	15
	Total Hours	30

References:

Sr. No.	Title	Author	Publisher	Edition	Year
1	Digital Fundamentals	Thomas L. Floyd	Pearson Education	11th	2015
2	Digital Design	M. Morris Mano, Michael D. Ciletti	Pearson Education	5th	2013
3	Fundamentals of Logic Design	Charles H. Roth Jr., Larry L. Kinney	Cengage Learning	7th	2013
4	Modern Digital Electronics	R. P. Jain	McGraw Hill Education	4th	2010
5	Digital Systems: Principles and Applications	Ronald J. Tocci, Neal Widmer, Gregory Moss	Pearson Education	12th	2017

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Programme Name: B.Sc. (AI & ML)		Semester: III
Course Category: VSC		
Name of the Dept: Science & Technology		
Course Title: R Programming Practical		
Course Code: BAIRP		Course Level:4.5
Type: Practical		
Course Credit: 2		
Hours Allotted :60 Hours		
Marks Allotted: 50 Marks		
Course Objectives: 1. Read Structured Data into R from various sources , Control structure & Functions in R 2. Understand basic graphical function & Import- Export data to & from R		
Course Outcomes: After completion of the course, learners would be able to: CO1: understand R Studio and explore the features & functions of R programming CO2: work with import and use the data and represent the data into tables, manipulating Data Frames & plot the graph using basic graphical function		
Description of the course:		R programming is highly relevant in various industries and fields due to its robust statistical and data analysis capabilities. This introductory R programming course insights into its relevance and demand in the industry.

Syllabus: NEP 2020 w.e.f 2026-27

Unit No.	Content (List of Practicals)	Hours
I	1. Working with numeric data a. Create Matrices and perform matrix operations like addition and multiplication. b. Create Arrays and perform operations on it c. Demonstrate matrix subtraction and transpose 2. Lists and Data Frames a. Create lists and access the elements from the list b. Create data frames and perform operations on it. c. Create a student data frame with Name, Age and Score columns and add column Passed in the same 3. Functions in R a. Use in built functions in R and explore their arguments b. Create simple user defined function and test it c. Write an R function that takes two numbers as input and returns their sum, difference, product, and quotient. 4. Control Flow and Loops a. Demonstrate 'if', 'else', and 'switch' conditions to control program flow. b. Use 'for' and 'while' loops to iterate over a vector and print its values. c. Write a script that generates a sequence of numbers from 1 to 100 and prints "Even" if a number is even and "Odd" if it is odd. 5. Writing and Debugging Functions a. Create a function that calculates the factorial of a number. b. Write a function that takes a numeric vector as input and returns the sum of all even numbers in the vector. 6. Managing and Manipulating Data a. Read and write data from a CSV file using 'read.csv()' and 'write.csv()'. b. Perform basic operations like filtering, sorting, and summarizing data. c. Download a sample dataset and perform the above operations. 7. Managing and Manipulating Excel Data a. Read and write data from and to excel b. Perform basic operations like filtering, sorting, and summarizing data. c. Download a sample dataset and perform the above operations. 8. Data Transformation with dplyr a. Use 'mutate()' to create new columns in an existing dataset. b. Apply 'filter()', 'select()', and 'arrange()' to manipulate datasets. c. Write an R script that groups a dataset by a categorical variable (e.g., department) and calculates the average value of a numeric column (e.g., salary) 9. Data Visualization in R – a. Create simple plots using 'plot()', 'hist()', and 'boxplot()'. b. Customize plots with colors, labels, and titles.	

	c. Take a sample dataset and plot histogram for the same 10. Data Visualization in R – a. Create a bar chart and scatter plot using ggplot2 b. Customize plots with colors, labels, and titles. c. Create an interactive visualization using plotly	
	Total Hours	60

References:

1. Introduction to Programming and Statistical Modelling in R, Aedin Culhane, HARVARD SCHOOL, 1st Edition 2013
2. Statistics - An introduction using R. John Wiley, Crawley, M. J. (2006), London
3. R Data Science Quick Reference, Thomas Mailund Apress 1st Edition 2019
4. THE BOOK OF R, Tilman M. Davies No starch press 1st 2016

Sheth T. J. Education Society's
Sheth N.K.T.T College of Commerce and
Sheth J.T.T College of Arts, Thane (W) (Autonomous)

Programme Name: B.Sc (AI & ML)		Semester: III
Course Category/Vertical: AEC		
Name of the Dept: Humanities		
Course Title: ह॑िंदी भाषा व्याव॑ारिक प्रयोग (1)		
Course Code: BAIH311	Course Level: 5	
Type: Theory / Practical		
Course Credit: 2 credits		
Hours Allotted: 30 Hours		
Marks Allotted: 50 Marks		
Course Objectives :		
१) विद्यावथिय ेक राजभाषा व ोंदी का विवि॑ित ज्ञान प्रदान करना। २) विद्यावथिय ेक सोंज्ञा आवद का ज्ञान प्राप्त नेकसाथ भाषाकेशुद्ध ,व्याि ारक रूप का ज्ञान प्रदान करना।		
Course Outcomes :		
CO1: विद्यावथिय ेक राजभाषा व ोंदी का ज्ञान प्राप्त गा, एिं दक्षता प्राप्त गी। CO2: विद्यावथिय ेक व ोंदी-सोंज्ञा आवद का ज्ञान प्राप्त नेकसाथ भाषाकेशुद्ध ,व्याि ारक रूप का ज्ञान गा।		
Description the course: भाषा का जीवन में सदैव म॑त्त्व ि॑ा ॑ै। जीवन औ भाषा का चोली - दामन का सिं॑िंध ॑ै। जब ॑मा॑िी भाषा मधु॑ि औ साथभक ॑ोती ॑ै तो श्रोता िि हवहशष्ट प्रभाव ि॑ता ॑ै। भाषा का यहद स॑ी औ साथभक रू॑ि से प्रयोग हक्या जाए तो मनुष्य जीवन में क॑ी॑िं भी असफल न॑ी॑िं ॑ो सकता ॑ै। इसी भाषा के माध्यम से ॑म सभी को अिनी ओ आकहषभत भी किते ॑ै। वर्तमान युग में ििोजगा॑ि में बहुत से क्षेत्र भाषा से जुडे हुए ॑ै, हजनके माध्यम से हवद्याथी इनका लाभ ग्र॑ण कि सकते ॑ै। भाषाई क्षमता ॑मा॑िे हवचा॑ि॑िं की सिंवा॑क ॑ोती ॑ै। आज हिहजटल युग में अहभव्यक्ति के कई माध्यमो॑िं का प्रसा॑ि हुआ ॑ै, इन माध्यमो॑िं में भाषा ॑ी सशि तत्त्व ॑ै जो आकी अहभव्यक्ति को ििि जगत को अवगत किती ॑ै। भाषा का म॑त्त्व ॑ि समय, ॑ि माध्यम में ि॑ा ॑ै, ििन्तु भाषा का साथभक रू॑ि का प्रयोग आज बहुत आवश्यक ॑ै। आज ह॑िंदी अिंतिभष्टर ीय स्ति िि प्रयोग में लाई जा ि॑ी ॑ै, तकनीकी, सूचना प्रौद्योहगक सोशल मीहिया, िाजनीहत की भाषा ह॑िंदी बन चुकी ॑ै। जीवन में कई क्षेत्रो॑िं में व्याव॑ारिक स्ति िि ॑में अिनी भाषा के हलक्ति स्वरु॑ि के कायों को किना ॑ोता ॑ै औ ऐसे में कायभ दक्षता म॑त्त्व ििती ॑ै। ह॑िंदी भाषा में व्याव॑ारिक प्रयोग को केंद्र में ििकि औ इन्ही ि॑लुओ को ध्यान में ििते हुए इस िाठ्यक्रम का गठन हक्या गया ॑ै। ॑म ह॑िंदी भाषा को स॑ी औ शुद्ध में प्रयोग कि अहभव्यक्ति को सफल बनाए औ हबना व्याकिण के य॑ सिंभव न॑ी॑िं ॑ै। इस दृष्टि से िाठ्यक्रम सवाभहधक लाभका॑िी हसद्ध ॑ोगा।		

Syllabus: NEP 2020 w.e.f.2025-26

Unit No.	Content	Hours
I	इकाई - १ व्याख्यान १५ क्रेडिट -१ १. वोंदी भाषा : सामान्य पररचय २. राजभाषा वोंदी : सौंिावनक म त्त ३. रिमाला : स्वर एिं व्योजन ४. शब्द भेद : सामान्य पररचय (सौंज्ञा आवद)	15
II	इकाई - २ व्याख्यान १५ क्रेडिट -0१ १. िाक्य : सामान्य पररचय २. ितिनी : शुद्धता का प्रय ग एिं सािावनयाँ सौं ३. कारक एिं विरामवचह ४. पत्रलेखन : (बिई, वनमोत्र, सुझाि, वशकायत, आभार, आिेदन, RTI लेखन)	15
	Total Hours	30

References:

सिद्मभ ग्रिथ -

१. बाबूिाम सक्सेना : सामान्य भाषा हवज्ञान , ह5िंदी साह5त्य सम्मेलन , प्रयाग
२. कामताप्रसाद गुरु ह5िंदी व्याकिण , लोकभािती प्रकाशन इला5ाबाद
३. आचायभ देवेंद्र नाथ शमाभ - भाषा हवज्ञान की भूहमका , िाधाकृष्ण प्रकाशन , हदल्ली
४. भाषा हवज्ञान एविं भाषा शास्त्र - कहिलदेव हदवेदी , हवश्वहवद्यालय प्रकाशन , वािाणसी
५. भोलानाथ हतवािी - भाषा हवज्ञान , हकताब म5ल , इला5ाबाद

Scheme of Examination

Internal : 20 Marks

External: 30 Marks

Internal	Marks: 20
Class test	10 marks
Assignments	5 Marks
Class Participation, GD, Presentation/Attendance etc	5 Marks

**Sheth T. J. Education Society's
Sheth N.K.T.T College of Commerce and
Sheth J.T.T College of Arts,(Autonomous) Thane (W)**

Programme Name: B.Sc (AI & ML)		Semester: III
Course Category/Vertical: AEC		
Name of the Dept: Humanities		
Course Title: व्यावहारिक मिठी		
Course Code: BAIM311		Course Level: 5
Type: Theory / Practical		
Course Credit: 2 credits		
Hours Allotted: 30 Hours		
Marks Allotted: 50 Marks		
Course Objectives:		
१) व्यववध काययक्रम व घटनाप्रसंगीच्या भाषणाचे ननवेदनाचे स्वरूप समजावून सांगणे. २) प्रभावी भाषण ननवेदनकिण्यासाठी आवश्यक असणाऱ्या क्षमता आणण तंत्राचा परिचय करून देणे. ३) प्रत्यक्ष भाषण ननवेदन किण्याची संधी उपलब्ध करून देणे. ४) कायायलयीन लेखन व्यवहाि स्वरूप समजावून सांगणे. ५) कायायलयीन पत्र व्यवहािाचे स्वरूप समजावून सांगणे. ६) प्रभावी कायायलयीन लेखनासाठी आवश्यक असणाऱ्या क्षमता आणण तंत्राचा परिचय करून देणे.		
Course Outcomes:		
CO1: प्रभावी कायायलयीन लेखन आणण पत्रव्यवहािासाठी आवश्यक असणाऱ्या क्षमता आणण तंत्राचा परिचय होईल.		
CO2: प्रभावी भाषण, ननवेदन किण्यासाठी आवश्यक असणाऱ्या क्षमता आणण तंत्राचा परिचय होईल.		

Description the course:	िाष्ट्रीय शैक्षणिक धोणि २०२० नुसाि पदवीच्या द्वितीय वर्षातील सत्रात क्षमता ववकसन अभ्यासक्रम या शीषयकांतगत आधुनिक भाषेचे अध्ययन अननवायय किण्यात आले आहे. आधुनिक भाषेचा प्रस्तुत अभ्यासक्रम व अध्ययन प्रामुख्याने भाषक क्षमता ववकसन केंद्री असावे असेही या धोणिनात नमूद किण्यात आलेले आहे. त्यामुळे या अभ्यासपत्रकेच्या अध्ययनातून ववद्यार्थ्यांना भाषक कौशल्यांचा तपशीलवाि परिचय करून देणे व ती आत्मसात किण्याची संधी उपलब्ध करून देणे अभिप्रेत आहे. या पाश्चयभूमीवि लेखन कौशल्य अंतगत उपयोजत लेखन कौशल्य आणण कायायलयीन पत्रव्यवहािाचे कौशल्य या अभ्यासपत्रकेत अपेक्षित आहे. कायायलयीन लेखन व्यवहाि आणण पत्रव्यवहाि या अभ्यास पत्रकेत भशकवला जाईल. तसेच भाषण कौशल्य या भाषक कौशल्याचा परिचय करून देणािी ही अभ्यास पत्रका आहे. या अभ्यासपत्रकेचे अध्ययन किणान्या ववद्यार्थ्यांमध्ये भाषण कौशल्याची जाण व क्षमता ववकभसत होईल हे लक्षात घेऊन प्रस्तुत अभ्यासपत्रकेची आखणी किण्यात आली आहे.
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Syllabus: NEP 2020 w.e.f 2025-26

Unit No.	Content	Hours
I	घटक १ : लेखन कौशल्ये (कायाालयीन लेखन व पत्रव्यवहार) १) इतिवृत्त लेखन २) अर्ा लेखन (नोकरीसाठी)	15

	३) पत्रात्मक लेखन (शुभेच्छा, तनमंत्रण) (६० भमननटांच्या एकूण १५ ताभसका श्रेयांकन १)	
II	घटक २ : भाषिक कौशल्य (भाणि) १) भाणि: संकल्पना, स्वरूप वैशिश्ट्ये, प्रकार २) भाषिक कौशल्य उपयोर्न- पूवाियारी, संहहि (शलखखि/मौखखक), काल- पररस्स्िी भान, भाषिक अंगिक वागिक कौशल्ये (६० भमननटांच्या एकूण १५ ताभसका श्रेयांकन १)	15
	Total Hours	30

References:

- १) प्रशासननक लेखन, भाषा संचालनालय, महािाष्ट्र शासन, मंुबई १९६६
- २) व्यावहारिक मिाठी, ल. िा. नभसिाबादकि, भाषा ववकास संशोधन संस्था, कोलहापूि २०२३
- ३) भावषक सजयन आणण उपयोजन, िाजन गवस, दयाय प्रकाशन, पुणे २०१२
- ४) वैखी : भाषा आणण भाषा व्यवहाि, स्नेहवधयन प्रकाशन, पुणे २०००

Scheme of Examination

Internal : 20 Marks

External: 30 Marks

Internal	Marks: 20
Class test	10 marks
Assignments	5 Marks
Class Participation, GD, Presentation/Attendance etc	5 Marks

**Sheth T. J. Education Society's
Sheth N.K.T.T College of Commerce and
Sheth J.T.T College of Arts,(Autonomous) Thane (W)**

Programme Name: B.Sc (AI & ML)	Semester:III
Course Category: Co-Curricular Course (CC)	
Name of the Department: Sociology	
Course Title: Fundamentals of Social Service and Volunteering	
Course Code: BAIN313	Course Level: 5
Type: Theory / Practical	
Course Credit: 2 credits	
Hours Allotted: 30 Hours	
Marks Allotted: 50 Marks	
Course Objectives: 1. To introduce students to the fundamental principles of social service and volunteering. 2. To develop a sense of social responsibility and commitment to community development.	
Course Outcomes: 1. Gain an understanding of the significance of social service in nation-building. 2. Develop an appreciation for volunteerism and its role in addressing social issues.	
Introduction: Social service and volunteering are essential aspects of a responsible and engaged society. They provide individuals with opportunities to contribute to the well-being of their communities while fostering personal growth and social awareness. This course aims to instill a spirit of volunteerism and service in students by equipping them with theoretical knowledge and practical experience in social service initiatives. Relevance and Usefulness: In today's world, social inequalities, environmental concerns, and community challenges require active engagement from individuals. Volunteering bridges the gap between the privileged and the underprivileged, offering solutions to pressing social issues. Through structured participation in social service activities, students develop empathy, teamwork, and leadership skills, making them responsible citizens and change-makers. Interest and Connection with Other Courses: This course complements various disciplines such as sociology, social work, public administration, psychology, and political science. The knowledge and skills gained through social service and volunteering enhance students' understanding of social structures, human behavior, and policy-making. Additionally, it fosters civic engagement, making it valuable for students aspiring to careers in social work, public service, or non-governmental organizations (NGOs).	

Syllabus: NEP 2020 w.e.f 2025-26

Unit No.	Content	Hours
I	UNIT I: Introduction to Social Servicing and Volunteering A. Meaning and Importance of Social Service B. Role of Youth in Social Service C. Challenges and Ethical Considerations in Voluntary Work	15
II	UNIT II: Community Engagement and Social Change A. Different Forms of Community Service (Health, Education, Environment, Disaster Relief) B. Government and Non-Government Organizations in Social Service C. Impact of Volunteerism on Society	15
	Total Hours	30

References:

- National Service Scheme Manual (Revised) 2006, Government of India, Ministry of Youth Affairs and Sports, New Delhi.
- University of Mumbai National Service Scheme Manual 2009.
- <http://nss.nic.in>
- <https://www.rccmindore.com/wp-content/uploads/2023/04/NSS-Notes-II.pdf>

Scheme of Examination

Internal : 20 Marks

External: 30 Marks

Internal	Marks: 20
Assignment	5 marks
Active participation/Attendance	5 Marks
Class test	10 Marks

Paper Pattern for Internal and External Examination

Internal Examination – Class Test

Q.1. MCQ question

10 marks

External Examination-

Assignment based on Community work.

30 marks

**Sheth T. J. Education Society's Sheth
N.K.T.T College of Commerce and Sheth
J.T.T College of Arts, Thane (W)
(Autonomous)**

Programme Name: B.Sc (AI & ML)		Semester: III
Course Category/Vertical: Co-Curricular (CC)		
Name of the Dept: Psychology		
Course Title: Yoga		
Course Code: BAIY313		Course Level: 5
Type: Theory / Practical		
Course Credit: 2 credits		
Hours Allotted: 30 Hours		
Marks Allotted: 50 Marks		
Learning Objectives: 1. To impart to the students the knowledge of teachings and philosophy of yoga tradition. 2. To provide the knowledge of various Yoga therapy practices like asana (posture), pranayama (voluntarily regulated breathing techniques).		
Course Outcomes (CO): OC 1. Students will be able to understand the basic principles and applications of Yoga. OC 2. Students will be able to use the Practical knowledge in their day to day life.		
Description the course: (Including but not limited to)		Yoga practices will be important for the upcoming lifestyle hence students can seek a career in the same. Students will understand the importance of yoga in life. Students will be having practical exposure. Hence, practicing yoga will help students to maintain their health.

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Unit No.	Content	Hours
I	Theory of Yoga A) Yogic Sanchalan (Yogic Movements), Kapalbhati (Cleansing Breath Technique), Suryanamaskar (Sun Salutation) B) Chandrabhedan Pranayama (Left Nostril Breathing), Surya Bhedana Pranayama (Right Nostril Breathing), Sakshi Bhav (Witness Consciousness)	15
II	Practical A) Padmasana (Lotus Pose), Parvatasana (Mountain Pose), Janushirasana (Head-to-Knee Forward Bend), Ustrasana (Camel Pose), Veerbhadrāsana (Warrior Pose), Trikonasana (Triangle Pose), Vrikshasana (Tree Pose), Ardha Naukasana (Half Boat Pose) B) Ardha Shalabhasana (Half Locust Pose), Makarasana (Crocodile Pose), Ardha Dronasana (Half Warrior Plank), Ardha Pavanmuktasana (Half Wind-Relieving Pose), Utthita Ekpadasana (Extended One-Leg Pose)	15
	Total Hours	30

References:

1. G. V Kadam - Yoga Life Sutra, Girish Vasant Kadam (2012)
2. ajayoga - Swami Vivekananda - Ramakrishna Ashrama Publications
3. C.D. Sharma: Critical Survey of Indian Philosophy, Motilal Banarsidass Publications 2003

Scheme of Examination

Course with Credit	External Examination	Internal Examination	Total
Credit 4	60 marks	40 marks	100 marks
Credit 2	30 marks	20 marks	50 marks

Internal Examination Structure(Theory)

Internal examination	40 marks	20 marks
Project Presentation/Case Study /Quiz/Group Discussion	10 marks	5 marks
Assignment /Active class Participation/Attendance	10 marks	5 marks
Class test	20 marks	10 marks
Total	40 marks	20 marks

Structure for Class Test

For 10 marks	
Q1. Fill in the blank (5 Marks) a. b. c. d. e. Q2. Answer in one or two lines (5 Marks) a. b. c. d. e.	10 Marks

External Examination (For 60 Marks)

Q. No.	External	Marks: 60
Q .1 (From Module 1)	Answer the following questions (Any 3) A B C D E F	15 Marks
Q. 2 (From Module 2)	Answer the following questions (Any 3) A B C D E F	15 Marks
Q. 3 (From Module 3)	Answer the following questions (Any 3) A B C D E F	15 Marks
Q. 4 (From Module 4)	Answer the following questions (Any 3) A B C D E F	15 Marks

External Examination (For 30 Marks)

Q. No.	External	Marks: 30
Q .1 (From Module 1)	Answer the following questions (Any 3) A B C D E F	15 Marks
Q. 2 (From Module 2)	Answer the following questions (Any 3) A B C D E F	15 Marks

Practical Exam Evaluation: 50 marks

A Certified copy journal is essential to appear for the practical examination.

1	Practical Question 1	20
2	Practical Question 1	20
3	Journal	5
4	Viva Voce	5

OR

1	Practical Question 1	40
2	Journal	5
3	Viva Voce	5