

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI
PG - COURSES – AFFILIATED COLLEGES
COURSE STRUCTURE FOR MASTER OF COMPUTER APPLICATIONS (MCA)
(Choice Based Credit System)
(With effect from the academic year 2021-22 onwards)

VISION AND MISSION OF THE UNIVERSITY

VISION

" To provide quality education to reach the unreached "

MISSION

- To conduct research, teaching and outreach programmes to improve conditions of human living
- To create an academic environment that honours women and men of all races, caste, creed, cultures and an atmosphere that values intellectual curiosity, pursuit of knowledge, academic freedom and integrity
- To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups.
- To develop partnership with industries and government so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development
- To provide quality / inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

The Educational Objectives of MCA programmes are:

- ❖ To prepare the graduates as successful professionals in software industry, Government, academia, research, entrepreneurial pursuit.
- ❖ To prepare the graduates as broadly educated, expressive, ethical and Responsible citizens with proven expertise and contributors to the society.
- ❖ To make the graduates recognized through demonstration of good analytical, Design and implementation skills.
- ❖ To prepare the graduates as life-long learners to fulfil their goals.

PROGRAMME OUTCOMES (PO):

After completion of the MCA programme the students are expected to have the:

- ❖ Ability to apply the knowledge of computing techniques and other related Specialisation for the abstraction and conceptualisation of computing models From the user requirements
- ❖ Ability to select modern computing tools and techniques and use them Confidently
- ❖ Ability to transform complex business challenges into well-defined problems, Investigate, understand and propose integrated solutions using emerging Technologies
- ❖ Ability to understand the impact of system solutions in a contemporary, Global, economic, environmental, and societal context for sustainable Development
- ❖ Ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude
- ❖ Ability to communicate the technical information effectively both orally and Practically
- ❖ Ability to appreciate the importance of goal setting and to recognize the need For life-long learning
- ❖ Ability to work collaboratively as a member or a leader in multidisciplinary teams

NORMS FOR ELIGIBILITY THIS PROGRAM

DURATION OF THIS M.C.A PROGRAMME:

- ❖ Two Years

ELIGIBILITY FOR THIS M.C.A PROGRAMME:

Passed BCA / Bachelor Degree in Computer Science Engineering or equivalent degree. OR Passed B.Sc / B.Com/ B.A.with Mathematics at 10+2 level or at Graduation level (with additional bridge courses as per the norms of the concerned University). Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination

Scheme of Examination

Theory Paper

Assessment Components (External : Internal – 75 : 25)

Internal Marks --25

Test	- 15 marks
Assignment	- 5 marks
Seminar	-- 5 marks
Total	- 25 marks

External Marks - 75 marks

Section A	: 10X 1marks	= 10 marks
Section B	: 5X 5 marks	= 25 marks
Section C	: 5X 8 marks	= 40 marks
Total		75 marks

Practical Paper

Assessment Components (External : Internal – 50 : 50)

The question paper pattern for all theory papers shall be as follows.

Duration of Exam: 3 Hours

Section	Type of questions	Mark
Part-A	Multiple choice question (Two question from each unit compulsory)	1×10=10 Marks
Part-B	Internal Choice questions (One question from each unit: either/or)	5×5=25 marks
Part-C	Internal Choice questions (One question from each unit: either/or)	8×5=40 marks
	Total	75 Marks

SEMESTER WISE COURSE LIST

Sem. (1)	Sub. No. (2)	Subject Status (3)	Subject Title (4)	Contact Hrs./Week (5)	Credit (6)
I	1	Core - 1	Mathematical Foundations for Computer Science	5	4
	2	Core - 2	Computer Organization and Architecture	5	4
	3	Core - 3	Design and Analysis of Algorithms Using C++	4	4
	4	Core - 4	Advanced Java Programming	4	4
	5	Core - 5	Object Oriented Analysis and Design Using UML	4	4
	6	Core - 6 Practical - 1	Design and Analysis of Algorithms Using C++ - Lab	4	2
	7	Core - 7 Practical - 2	Advanced Java Programming - Lab	4	2
II	8	Core - 8	Financial and Management Accounting	5	4
	9	Core - 9	Machine Learning using Python	5	4
	10	Core - 10	Advanced Web Technology	4	4
	11	Core - 11	Advanced Database Management System	4	4
	12	Elective – 1 (Select any ONE)	Distributed Operating System/ Cloud Computing /Soft Computing /Cyber Security	4	3
	13	Core - 12 Practical - 3	Machine Learning using Python - Lab	4	2
	14	Core - 13 Practical – 4	Advanced Web Technology - Lab	4	2

III	15	Core – 14	Data Science & Analytics	4	4
	16	Core – 15	Advanced Digital Image Processing	4	4
	17	Core – 16	Principles of Compiler Design	4	4
	18	Core – 17	Research Methodology	4	4
	19	Elective – 2	Optimization Techniques/ Mobile Application Development/ Mobile Computing/ Professional Ethics	4	3
	20	Core - 18 Practical - 3	Data Science & Analytics using R Lab	4	2
	21	Core - 19 Practical - 4	Mini Project	6	6
IV	22	Core – 20	Major Project	30	16

Core-1: MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE

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OBJECTIVES

- ❖ To provide the strong mathematical foundation that will help the students in writing programs.
- ❖ To improve the logical reasoning while programming with computer languages.

OUTCOMES

- ❖ Apply the fundamentals of set theory and matrices for the given problem.2.
- ❖ Apply the types of distribution, evaluate the mean and variance for the given case study/ problem.
- ❖ solve the given problem by applying the Mathematical logic concepts
- ❖ Model the given problem by applying the concepts of graph theory.
- ❖ Identify and list the different applications of discrete mathematical concepts in computer science.

UNIT – I SET THEORY AND MATRICES

Sets, Operations on sets, Cardinality of sets, inclusion-exclusion principle, pigeonhole Principle, matrices, finding Eigen values and Eigen vectors. **(12L)**

UNIT – II MATHEMATICAL LOGIC

Propositional Logic, Applications of Propositional Logic, Propositional Equivalences
Predicates and Quantifiers, Nested Quantifiers, Rules of Inference Introduction to Proofs

(12L)

UNIT – III RELATIONS

Relations and Their Properties, n-ary Relations and Their Application, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings(12L)

UNIT – IV RANDOM VARIABLE AND PROBABILITY DISTRIBUTION

Concept of random variable, discrete probability distributions, continuous probability Distributions, Mean, variance and co-variance and co-variance of random variables. Binomial And normal distribution, Exponential and normal distribution with mean and variables and Problems. (12L)

UNIT – V GRAPH THEORY

Graphs and Graphs models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring (12L)

TOTAL : 60 PERIODS

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K ₁ to K ₆
CO1	PO3	H	PSO1	H	K ₁
CO2	PO3, PO6	H/M	PSO2, PSO6	H/M	K ₂
CO3	PO1, PO2, PO5	H/M/M	PSO4	M	K ₃
CO4	PO1, PO5	H/M	PSO4	H	K ₄
CO5	PO3, PO4	H/M	PSO4, PSO5	H/M	K ₅

(L – Low, M – Medium, H – High; K₁ –Understand, K₂ –Apply, K₃ –Analyze, K₄ –Evaluate, K₅ Create).

REFERENCES

1. Kenneth H Rosen, “Discrete Mathematics and its Applications”, McGraw Hill Publications, 8th edition, 2018
2. Wolpole Myers Ye “Probability and Statistics for engineers and Scientist” Pearson Education, 9th edition, 2017
3. NarasinghDeo, — Graph Theory with Applications to Engineering and Computer Science, Prentice-Hall of India Private Limited, 2017.

Core -2: COMPUTER ORGANIZATION AND ARCHITECTURE

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OBJECTIVES

- ❖ To understand the basic structure and operation of digital computer.
- ❖ To understand the basic processing concepts and bus organization.
- ❖ To understand the two types of control unit techniques and the concept of pipelining.
- ❖ To understand the different ways of communication with I/O devices and standard I/O interfaces

OUTCOMES

- ❖ Understand the functional units of a computer, bus structures and addressing.
- ❖ Analyze RAM, ROM, and cache memory and virtual memory concepts.
- ❖ Evaluate the modes.
- ❖ Know about single bus, multiple bus organization.
- ❖ Design and analyze the pipelining concepts and various I/O interfaces.

UNIT I

Introduction: Digital Computers-Basic Organization of a Computer-Historical Perspective.

Digital Logic Circuits:Digital Computers-Logic Gates-Boolean Algebra-Map Simplification-Combinational Circuits – flipflops.

Digital Components:Integrated Circuits – Decoders – Multiplexers – Registers-Shift Registers-Binary Counters.

Data Representation:Data Types – Complements-Fixed-Point Representation-Conversion of Fractions-Floating-Point Representation.

(12L)

UNIT II

Register Transfer and Microoperations: Register Transfer-Bus and Memory Transfers-ArithmeticMicrooperations-Logic Microoperations-Shift Microoperations-Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes-Computer Registers-Computer Instructions-Timing and Control-Instruction Cycle.

Programming the Basic Computer:Machine Language-Assembly Language-TheAssembler-Subroutines.

(12L)

UNIT III

Microprogrammed Control: Control Memory-Address Sequencing-Design of Control Unit.

Central Processing Unit: General Register Organization-Stack Organization-Instruction Formats-Addressing Modes-Data Transfer and Manipulation-Program Control-CISC Characteristics-RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing – Pipelining – Arithmetic Pipeline – Instruction – RISC Pipeline – Vector processing – Array Processor.

(12L)

UNIT IV

Computer Arithmetic: Addition and Subtraction-Multiplication Algorithms-Division Algorithms-Decimal Arithmetic Unit-Decimal Arithmetic Operations.

Input-Output Organization: Peripheral Devices-Input-Output Interface-Asynchronous Data Transfer-Modes of Transfer-Direct Memory Access (DMA)-Serial Communication-Bus Standards.

(12L)

UNIT V

Memory Organization: Memory Hierarchy-Main Memory-Auxiliary Memory-Associative Memory-Cache Memory-Virtual Memory.

Multiprocessors: Characteristics of Multiprocessors-Interconnection Structures.

(12L)

TOTAL: 60 PERIODS

Mapping of COs to POs and PSOs

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CO1	PO3	H	PSO1	H	K ₁
CO2	PO3, PO6	H/M	PSO2, PSO6	H/M	K ₂
CO3	PO1, PO2	H/M	PSO4	M	K ₃
CO4	PO1, PO5	H/M	PSO4	H	K ₄
CO5	PO3, PO4	H/M	PSO4, PSO5	H/M	K ₅

(L – Low, M – Medium, H – High; K₁ –Understand, K₂ –Apply, K₃ –Analyze, K₄ –Evaluate, K₅ Create).

Reference Books:

1. M. Morris Mano, Rajib Mall, “Computer System Architecture– Revised”, Third Edition, Pearson India Education Services Pvt. Ltd., 2017.
2. John P Heys, “Computer Architecture and Organization”, 3rd Edition, McGraw Hill 1998.
3. William Stallings, “Computer Organization and Architecture – Designing for Performance”, 10th Edition, Pearson Education, 2016.
4. Alka Viswa, “Computer Organization and Architecture”, Dreamtech Press, 2019.

CORE – 3: DESIGN AND ANALYSIS OF ALGORITHMS USING C++

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OBJECTIVES

- ❖ To learn effective problem solving in computing applications and analyze the algorithmic procedure to determine the computational complexity of algorithms.

OUTCOMES

- ❖ It gives stepwise procedure to solve problems.
- ❖ The Problems can be broken down into small pieces for program development.
- ❖ Efficient approach of solving problems by a model of computations

UNIT - I

Introduction: Algorithm-Specification-Performance Analysis. Data Structures: Lists – Stacks- Queues – Trees – Graphs – Dictionaries - Priority Queues. **(12 L)**

UNIT - II

Divide And Conquer: General Method-Binary Search- Finding the Maximum And Minimum- Quicksort - Strassen's Matrix Multiplication. **(12 L)**

UNIT - III

The Greedy Method: General Method- 0/1 Knapsack Problem-Job Sequencing with Deadlines – Minimum-Cost Spanning Tree- Single-Source Shortest Paths.

Dynamic Programming: General Method- All-Pairs Shortest Path- 0/1 Knapsack Problem. **(12 L)**

UNIT - IV

Basic Traversal and Search Techniques: Techniques for Binary Trees-Graphs- Connected Components and Spanning Trees.

Backtracking: General Method- N-Queen Problem- Hamiltonian Circuit Problem.

(12 L)

UNIT - V

Branch and Bound: Method- Assignment Problem - Knapsack Problem.

NP-Hard And NP-Complete Problem: Basic Concepts-Cook's Theorem- -Job Shop Scheduling. **(12L)**

TOTAL: 60 PERIODS

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K ₁ to K ₆
CO1	PO1, PO2, PO6	H/M/M	PSO4	M	K ₃
CO2	PO3, PO5	H/M	PSO5	H	K ₄
CO3	PO3, PO4	H/M	PSO2, PSO6	H/M	K ₅

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Reference Books:

1. Sandeep Sen and Amit Kumar Design and Analysis of Algorithms: A contemporary perspective, Cambridge University Press, 2019.
2. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, “Fundamentals of Computer Algorithms”, 2nd Edition, Universities Press (India) Private Ltd., 2008
3. Aho, Hopcroft and Ullman, “The Design and Analysis of Computer Algorithm”, Pearson Education, Delhi, 2001.
4. S.Sridhar, “Design and Analysis of Algorithms”, Oxford University Press, 2015.
5. Basu S.K., “Design Methods and Analysis of Algorithms”, PHI, 2006.
6. M.A.Weiss, “Data Structures and algorithm Analysis in C++”, Pearson Education, Asia, 2013.

Core 4 : ADVANCED JAVA PROGRAMMING

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OBJECTIVES

- ❖ To learn the advanced concepts in the java language and java programming environment.
- ❖ To design webpage.
- ❖ To develop webpage using scripting,

OUTCOMES

- ❖ Able to write java programs
- ❖ Understand the importance of JDBC
- ❖ Apply the Java programming techniques for providing the solution for the practical problems

UNIT I

OOP and Java: Introduction to Java Language – Object Oriented Programming - Classes and Objects – Methods – Constructor - Overloading Methods.

Inheritance: Introduction – Inheritance Types – General form of subclass – subclass constructor – method overriding – abstract and final classes.

Packages and Interfaces: Defining a package – import statement – setting class path – Interfaces – Defining an interface – implementing interfaces

Enumerations, Autoboxing and Annotations: Enumerations – Type Wrappers – Autoboxing – Annotations (metadata)

(12L)

UNIT II

Input/output : I/O Basics – Byte Streams and Character Streams – Predefined Streams – Reading console input and writing console output – PrintWriter class – Reading and writing Files –Closing a File

Generics and Collections: Generics– Generics example – Generic class with two type parameters – Bounded types – Wildcard arguments – Generic method – Generic constructors – Generic interfaces

Collections :Collections – Collection interfaces – Collection classes – accessing a collection – Working with Maps –Arrays – Vector – Stack – Dictionary – Hashtable – Properties – Using Store () and load ().

(12L)

UNIT III

Swing :Introduction – Components and Containers – Swing packages – simple Swing application – Event handling – JApplet – Painting in Swing – JLabel – JTextField – JButton – JCheckbox - JRadioButton – JTabbedPane – JScrollPane – JList – JComboBox – Dialogs – JTable – JMenu

JDBC: Java database connectivity, Types of JDBC drivers, Writing JDBC applications – Types of statement objects (Statement, PreparedStatement, and CallableStatement), Types of Resultset – Inserting and updating records – Using Transactions.

(12L)

UNIT IV

NIO: NIO classes – Buffers – Channels – Path Interface – Files class – Paths class – File attribute interfaces – Reading and writing a File via a Channel – Stream-Based I/O – Path and File System operations

Networking: Networking Classes and Interfaces – InetAddress – TCP/IP – UDP

RMI: Introduction – Remote Interface – java.rmi package – Naming Class – RMI Exception – Creating a simple RMI Client/Server application.

(12L)

UNIT V

Java Beans: An overview of Java Beans – Properties, Events and Methods – Introspection - Builder Tools – JDK – Persistence – Java Beans API – A Bean Example

Java Servlets :Java Servlets and CGI Programming – Life cycle of a Servlet – Tomcat – A Simple Servlet – javax.servlet - javax.servlet.http – Handling HTTP requests and responses – Working with Cookies – Tracking Sessions.

(12L)

TOTAL: 60 PERIODS

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K ₁ to K ₆
CO1	PO1, PO2, PO6	H/M/M	PSO2	M	K ₃
CO2	PO1, PO5	H/M	PSO4	H	K ₄
CO3	PO3, PO4	H/M	PSO5, PSO6	H/M	K ₅

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1. Herbert Schildt: Java – The Complete Reference, Eleventh Edition, Tata McGraw-Hill, 2019
2. Balagurusamy : Programming with Java, Sixth Edition, Tata McGraw-Hill, 2019
3. Jim Keogh: J2EE – The Complete Reference, Second Edition, Tata McGraw-Hill, 2007
4. Patrick Niemeyer and Daniel Leuck : Learning Java, Fourth Edition, O’Reilly Media, 2013

Core 5: OBJECT ORIENTED ANALYSIS AND DESIGN USING UML

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OBJECTIVES

- ❖ To understand objects, classes and OO concepts
- ❖ To study the various phases of software development, models and design methodologies
- ❖ To use UML diagrams for software design
- ❖ To develop applications using UML

OUTCOMES

- ❖ Analyze the Systems Development Life Cycle
- ❖ Identify the basic software requirements UML Modeling
- ❖ Apply software design with UML diagrams
- ❖ Develop applications using UML

UNIT I - INTRODUCTION

An overview - Object Basics - Object State and Properties – Behavior and Methods – Respond to Message – Encapsulation and Information Hiding – Class Hierarchy – Relationship and Associations – Aggregation – Advanced Topics – Object oriented system development life cycle **(12L)**

UNIT II – METHODOLOGY AND UML

Introduction – Survey – Rumbaugh ,Booch , Jacobson Methods – Patterns – Frameworks- Unified Modeling Language: Introduction - Static and dynamic Models – Modeling - UML Diagrams – UML Class Diagram – Use-case Diagram – UML Dynamic Modeling – Model Management – UML Extensibility **(12L)**

UNIT III – OBJECT-ORIENTED ANALYSIS

Identifying Use cases: Introduction - Business Object Analysis – Use case driven Object oriented analysis – Use-case Model – Documentation – Classification: Introduction – Classification Theory – Naming Classes Language - Constraint– Introduction – Object-Oriented Design Philosophy –UML Object Identifying Object relationships, Attributes and Methods: Super sub class – A part of relationships aggregation – Object responsibility – Methods for ViaNet bank objects. **(12L)**

UNIT IV – OBJECT- ORIENTED DESIGN

Object Oriented Design process and Design axioms: Axioms – corollaries – Design Patterns – Designing Classes : Class visibility – Refining attributes – Methods and protocols – Object – relational system – Multi Database System – Designing Interface Object - Macro and Micro level process – Purpose of a view layer interface. (12L)

UNIT V – QUALITY AND TESTING

Quality Assurance – Testing Strategies – Impact of Object Orientation on Testing – Test Plan – Test cases system usability – Usability Testing.(12L)

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Mapping of COs to POs and PSOs

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2. Jaya Mala, S. Geetha, “Object Oriented Analysis and Design using UML”, McGraw Hill Education, 2013
3. AtulKahate, “Object Oriented Analysis and Design”, Tata McGraw Hill Education, 2004.
4. Mahesh P.Matha, “Object-Oriented Analysis and Design Using UML”, PHI Learning Private Limited, 2012.
5. F. Margret Sharmila, N.Jayanthi, Dr.R.Vasanthi, A.Surya, Dr.R.Palson Kennedy, “Object Oriented Analysis & Design”, Charulatha Publications Private Limited, 2019

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Core 5: OBJECT ORIENTED ANALYSIS AND DESIGN USING UML

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OBJECTIVES

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OUTCOMES

- ❖ Analyze the Systems Development Life Cycle
- ❖ Identify the basic software requirements UML Modeling
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UNIT I - INTRODUCTION

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7. Jaya Mala, S. Geetha, “Object Oriented Analysis and Design using UML”, McGraw Hill Education, 2013
8. AtulKahate, “Object Oriented Analysis and Design”, Tata McGraw Hill Education, 2004.
9. Mahesh P.Matha, “Object-Oriented Analysis and Design Using UML”, PHI Learning Private Limited, 2012.
10. F. Margret Sharmila, N.Jayanthi, Dr.R.Vasanthi, A.Surya, Dr.R.Palson Kennedy, “Object Oriented Analysis & Design”, Charulatha Publications Private Limited, 2019

Core 6: Practical -1:DESIGN AND ANALYSIS OF ALGORITHMS USING C++ - LAB

L T P C

0 1 4 2

Programs should include but not limited to:

1. Write a program that implements Stack
2. Write a program to implement Queue
3. Write a program that implements Singly Linked List.
4. Write a program to implement Evaluation of Postfix expression.
5. Write a program to implement Priority Queue.
6. Write a program that implements Binary Tree Traversals.
7. Write a program that implements BFS
8. Write a program that implements DFS
9. Write a program to implement Binary Search using DAC technique.
10. Write a program to implement Quick Sort using DAC technique.
11. Write a program that implements Strassen's matrix multiplication using Greedy Method.
12. Write a program that implements Knapsack problem using Greedy Method.
13. Write a program that implements Prim's Algorithm
14. Write a program that implements Kruskal's Algorithm
15. Write a program that implements All-pairs Shortest path problem
16. Write a program that implements N-Queen Problem

Core -7, Practical-2 : ADVANCED JAVA PROGRAMMING LAB

L T P C

0 1 4 2

1. Write a Java application program to demonstrate class with constructors and method overloading.
2. Write a Java application program to demonstrate inheritance and method overriding.
3. Write a Java application program to demonstrate package with classes and interfaces.
4. Write a Java application program to read and write a file using file I/O.
5. Write a Java application program to find minimum and maximum of integers and characters using Generics.
6. Write a Java application program to implement the Queue operations using the Linked List Class.
7. Write a Java program using the swing components with event handling.
8. Write a Java program using menus in swing.
9. Write a program in Java to create a table and insert and query records in the table.
10. Write a program in Java to read a file using Channel I/O.
11. Write a program in Java to implement a client/server environment using TCP/IP.
12. Write a program in Java to implement a client/server environment using UDP.
13. Write a program in Java to implement a client/server using RMI.
14. Write a program in Java to create a form and validate a password using Servlet.
15. Write a program in Java to develop a simple Java Bean.

Core 8: FINANCIAL AND MANAGEMENT ACCOUNTING

L T P C

5 0 0 4

OBJECTIVES

- ❖ To understand the fundamental accounting concepts, the elements of financial statements, and basic accounting vocabulary.
- ❖ To explain the basic features of accounting and reporting by organizations, including the principles underlying the design, integrity, and effectiveness of information systems

OUTCOMES

- ❖ Perform the accounting analysis
- ❖ Explain the basic features and issues in accounting.
- ❖ Prepare the financial statements.

UNIT I

Principles, Accounting concepts, Methods of Accounting, Types of Accounting – Accounting Rules. Journal, Rules for Debit and Credit, Compound Journal entry, Advantages of Journal, Ledger, Ledger Account, Ledger Posting, Process of Posting, Balancing of an Account, Significance of Balances, Relation between Journal and Ledger-Subsidiary Books.

(12L)

UNIT II

Trial Balance: Objects, Methods of Preparing Trial balance, how to locate errors, hints for the preparation of trial balance & problems. Trading account – individual items posted to the debit of trading account – individual items credited to trading account – advantages of trading account – profit & loss account - advantages of profit & loss account - balance sheet- classification of assets & liabilities

(12 L)

UNIT III

Ratio analysis: Meaning – classification of ratios – Liquidity ratios - Profitability ratios– Advantages – Limitations.

Fund flow analysis: Meaning of the term fund – Working capital – statement of changes in working capital – preparation of fund flow statement.

(12 L)

UNIT IV

Cost accounting: meaning of costing – scope – importance – cost classification - Marginal costing – Nature – scope – importance Break-even-point – Break even chart – P/V ratio – Marginal costing and management decisions. (12 L)

UNIT V

Standard costing and Variance analysis: Nature, scope, advantages - Limitations, computation and analysis of variances with reference to material cost and Labour cost.

Budget and Budgetary Control: Meaning – Budget – Budgetary control – Advantages – Limitations – classification of budgets - preparation of sales budget –Flexible budget.

(12 L)

TOTAL:60 PERIODS

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K ₁ to K ₆
CO1	PO3, PO6	H/M	PSO2, PSO6	H/M	K ₂
CO2	PO1, PO5	H/M	PSO4	H	K ₄
CO3	PO3, PO4	H/M	PSO4, PSO5	H/M	K ₅

(L – Low, M – Medium, H – High; K₁ –Understand, K₂ –Apply, K₃ –Analyze, K₄ –Evaluate, K₅ Create).

Reference Books:

1. N.P.SrinivasanM.SakthivelMurugan, - Accounting for Management – S.Chand& Sons, New Delhi.
2. SP Jain and KL Narang – Advanced Accounting - Kalyani Publishers, New Delhi.
3. S P Iyengar – Advanced Accounting - Sultan Chand & Sons, New Delhi.
4. S N Maheswari and C B Gupta - Financial management – Sultan Chand & Sons, New Delhi.
5. S. N. Maheswari and C B Gupta - Management Accounting – Sultan Chand & Sons, New Delhi.

Core 9: MACHINE LEARNING USING PYTHON

OBJECTIVES

- ❖ To Learn about Machine Intelligence and Machine Learning applications
- ❖ To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems.
- ❖ To understand how to perform evaluation of learning algorithms and model selection.

OUTCOMES

- ❖ Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
- ❖ Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
- ❖ Be able to design and implement various machine learning algorithms in a range of real-world applications.

UNIT I

Introduction - Why Machine Learning? - Problems Machine Learning Can Solve - Knowing Your Task and Knowing Your Data - Why Python? - scikit-learn - Installing scikit-learn - Essential Libraries and Tools - Supervised Learning - Classification and Regression - Generalization, Over fitting, and Under fitting - Supervised Machine Learning Algorithms.

(12L)

UNIT II

Unsupervised Learning and Preprocessing - Types of Unsupervised Learning - Challenges in Unsupervised Learning - Preprocessing and Scaling - Dimensionality Reduction, Feature Extraction, and Manifold Learning – Clustering.

(12L)

UNIT III

Representing Data and Engineering Features - Categorical Variables - Binning, Discretization, Linear Models, and Trees - Interactions and Polynomials - Univariate Nonlinear Transformations - Automatic Feature Selection – Utilizing Expert Knowledge.

(12L)

UNIT IV

Model Evaluation and Improvement - Cross-Validation - Grid Search - Evaluation Metrics and Scoring. (12 L)

UNIT V

Algorithm Chains and Pipelines - Parameter Selection with Preprocessing - Building Pipelines - Using Pipelines in Grid Searches - The General Pipeline Interface - Grid-Searching Preprocessing Steps and Model Parameters -Grid-Searching Which Model To Use.

(12L)

TOTAL: 60 PERIODS

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K ₁ to K ₆
CO1	PO1, PO2, PO5	H/M/M	PSO2, PSO6	M/H	K ₃
CO2	PO3, PO5	H/M	PSO4	H	K ₄
CO3	PO3, PO4	H/M	PSO4, PSO5	H/M	K ₅

(L – Low, M – Medium, H – High; K₁ –Understand, K₂ –Apply, K₃ –Analyze, K₄ –Evaluate, K₅ Create).

REFERENCE BOOKS:

1. Andreas C. Müller, Sarah Guido, “Introduction to Machine Learning with Python”, O’Reilly Media, Inc, October 2016.
2. Jeremy Watt , Reza Borhani, Aggelos K. Katsaggelos, “Machine Learning Refined - Foundations, Algorithms, and Applications” , Second Edition, Cambridge University Press , 2020.
3. MehryarMohri, AfshinRostamizadeh, AmeetTalwalkar, Foundations of Machine Learning, Second Edition, the MIT Press, 2018.
4. John Paul Mueller and Luca Massaron, Machine Learning (in Python and R) For Dummies, John Wiley & Sons, 2016.

Core 10: ADVANCED WEB TECHNOLOGY

L T P C

4 0 0 4

OBJECTIVES

- Explore the backbone of web page creation by developing .NET skill.
- Enrich knowledge about HTML control and web control classes
- Provide depth knowledge about ADO.NET
- Understand the need of usability, evaluation methods for web services

OUTCOMES

- Design a web page with Web form fundamentals and web control classes
- Recognize the importance of validation control, cookies and session
- Apply the knowledge of ASP.NET object, ADO.NET data access and SQL to develop a client server model.
- Recognize the difference between Data list and Data grid controls in accessing data.

UNIT – I OVERVIEW

OVERVIEW OF ASP.NET - The .NET framework – Learning the .NET languages
Data types – Declaring variables- Scope and Accessibility Variable operations- Object Based manipulation- Conditional Structures- Loop Structures- Functions and Subroutines. Types, Objects and Namespaces : The Basics about Classes- Value types and Reference types- Advanced class programming- Understanding name spaces and assemblies. Setting Up ASP.NET and IIS (12L)

UNIT – II APPLICATIONS

Developing ASP.NET Applications - ASP.NET Applications: ASP.NET applications– Code behind- The Global. asax application file Understanding ASP.NET Classes- ASP.NET Configuration. Web Form fundamentals: A simple page applet- Improving the currency converter- HTML control classes- The page class- Accessing HTML server controls. Web controls: Web Control Classes – AutoPostBack and Web Control events- Accessing web controls. Using Visual Studio.NET: Starting a Visual Studio.NET

Project- Web form Designer Writing code- Visual studio.NET debugging. Validation and Rich Controls: Validation- A simple Validation example- Understanding regular expressions- A validated customer form. State management - Tracing, Logging, and Error Handling.

(12L)

UNIT – III WORKING WITH DATA

Working with Data - Overview of ADO.NET - ADO.NET and data management- Characteristics of ADO.NET-ADO.NET object model. ADO.NET data access : SQL basics– Select , Update, Insert, Delete statements- Accessing data- Creating a connection- Using a command with a DataReader - Accessing Disconnected data - Selecting multiple tables – Updating Disconnected data. Data binding: Single value Data Binding- Repeated value data binding- Data binding with data bases. Data list – Data grid – Repeater – Files, Streams and Email – Using XML

(12L)

UNIT – IV WEB SERVICES

Web Services - Web services Architecture: Internet programming then and now- WSDL–SOAP- Communicating with a web service-Web service discovery and UDDI. Creating Web services: Web servicebasics- The StockQuote web service – Documenting the web service- Testing the web service- Web service Data types- ASP.NET intrinsic objects. Using web services: Consuming a web service- Using the proxy class- An example with TerraService.

(12L)

UNIT – V ADVANCED ASP.NET

Advanced ASP.NET - Component Based Programming: Creating a simple component – Properties and state- Database components- Using COM components. Custom controls: User Controls- Deriving Custom controls. Caching and Performance Tuning: Designing and scalability– Profiling- Catching- Output catching- Data catching. Implementing security: Determining security requirements- The ASP.NET security model- Forms authentication- Windows authentication.

(12L)

TOTAL : 60 PERIODS

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K ₁ to K ₆
CO1	PO3	H	PSO1	H	K ₁
CO2	PO3, PO6	H/M	PSO2, PSO6	H/M	K ₂
CO3	PO1, PO2, PO5	H/M/M	PSO4	M	K ₃
CO4	PO3, PO4	H/M	PSO4, PSO5	H/M	K ₅

(L – Low, M – Medium, H – High; K₁ –Understand, K₂ –Apply, K₃ –Analyze, K₄ –Evaluate, K₅ Create).

REFERENCES

1. Mathew Mac Donald, “ASP.NET Complete Reference”, TMH 2017.
2. Web Technologies HTML, Javascript, PHP, Java, JSP, ASP.NET, XML and AJAX Black Book By: Kogent Learning Solutions Inc.

Core 11: ADVANCED DATABASE MANAGEMENT SYSTEM

L	T	P	C
4	0	0	4

OBJECTIVES

- Acquire Knowledge of Database Models, Applications of Database Models and Emerging Trends.
- To enable the students to understand the concepts behind the relational database management system and its design.

OUTCOMES

- Know about the Various Data models and Works on Database Architecture
- Knowledge patterns, Object Oriented Databases are well equipped.
- Able to understand the database activities such as recovery, administration, backup, etc.

UNIT – I

Introduction: Purpose of data base systems – Data Models – Data abstraction - Database Languages – Functional components of a Database System - System structure – DBA – Database Users.

Relational Model: Structure of Relational databases - Database schema – Keys – Schema diagram - Relational Algebra – Integrity constraints. (12 L)

UNIT - II

Data Normalization: First, Second and Third normal forms – Boyce-Codd Normal Form – Fourth and fifth normal forms – Domain-Key normal form– Database Design. **E-R Model:** Entity – Relationship - Attributes— mapping cardinalities – E-R Diagrams – Extended Entity Relationship Model. **Complex Data Types:** Semi-structured data – objected-orientation – Textual data – Spatial data – Temporal data. (12 L)

UNIT – III

SQL: Introduction to SQL – SQL Data Definition – SQL Queries – where, order by – Set operations – Null values – Aggregate Functions – Nested subqueries – Insert, update, delete – Join – views – SQL data types and schemas – Index – Authorization – Procedures – Functions – Triggers – Advanced aggregation features (12 L)

UNIT - IV

Transactions: Transaction Concept – A simple Transaction model – Storage Structure – Transaction Atomicity and Durability – Transaction Isolation – Serializability. **Concurrency Control:** Lock based Protocols – Deadlock Handling – Multiple Granularity – Timestamp Based Protocols – Validation Based Protocols – Multiversion Schemes – Snapshot Isolation – Insert Operations, Delete

Operations and Predicate Reads.**Recovery Systems:** Failure Classification – Storage – Recovery and Atomicity – Recovery Algorithm – Buffer Management (12 L)

UNIT - V

Database System Architecture: Centralized and Client Server Architectures – Server System Architectures – Parallel Systems – Distributed Systems. **Parallel Databases:** Introduction – I/O parallelism – Interquery parallelism – Intraquery parallelism – Intraoperation parallelism – Interoperation parallelism.**Distributed Databases:** Homogeneous and Heterogeneous Databases – Distributed Data Storage – Distributed Transactions. (12 L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	PO3	H	PS02,PS05	M/H	K1
CO2	PO2	H	PS06,PSO4	M/H	K5
CO3	PO1,PO4	M/H	PS03	M	K2

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5–Evaluate, K6 – Create)

TOTAL: 60 PERIODS

Reference Books:

1. Abraham Silberschatz, Henry F. Korth, Sudarshan S: Database System Concepts, Seventh Edition, McGraw-Hill, 2019
2. Kevin Loney: Oracle Database 11g - The Complete Reference, McGraw-Hill, 2008.
3. Mathews Leon and Alexis Leon: Database Management Systems, Vikas Publishing 2008.
4. RamezElmashree, ShamkantB.Navathe: Fundamentals of Database Systems, Pearson Education, 2011.
5. C. J. Date: Introduction to Database Systems, 8th Edition, Pearson Education, 2003
Rajesh Narang: Database Management Systems, 2nd Edition, PHI, 2012.

Elective 1: 1. DISTRIBUTED OPERATING SYSTEM

OBJECTIVES

- To study Distributed operating system concepts
- To understand hardware, software and communication in distributed OS
- Practices to learn concepts of OS and Program the principles of Operating Systems

L	T	P	C
4	0	0	3

OUTCOMES

- Clear understanding on several resource management techniques like distributed shared memory and other resources
- Able to design and implement algorithms of distributed shared memory and commit protocols
- Able to design and implement fault tolerant distributed systems

UNIT – I

Fundamentals: What is Distributed Operating System? – Evolution of Distributed Computing System – Distributed Computing System Models – Why are Distributed Computing Systems gaining popularity? – What is a Distributed Computing System? – Issues in Designing Distributed Computing System – Introduction to Distributed Computing Environment (DCE). Computer Networks: Introduction– Network Types – LAN Technologies–WAN Technologies– Communication Protocols – Internetworking – ATM Technology. **(9L)**

UNIT - II

Message Passing: Introduction –Desirable features of Good Message Passing System – Issues in IPC Message Passing – Synchronization – Buffering – Multi datagram Messages – Encoding and Decoding of Message Data– Process Addressing – Failure Handling – Group Communication**(9L)**

UNIT – III

Remote Procedure Calls : Introduction– The RPC Model – Transparency of RPC– Implementing RPC mechanism–Stub Generation–RPC Messages–Marshaling Arguments and Results–Server Management– Parameter Passing Semantic–Call Semantics–Communication Protocol for RPC's – Complicated RPC's –Client Server Binding–Exception Handling–Security–Some Special Types of RPC's –RPC in Heterogeneous Environments – Lightweight RPC. Distributed Shared Memory: Introduction – General Architecture of DSM Systems – Design and Implementation Issues of DSM – Granularity – Structure of Shared Memory – Consistency Models – Replacement Strategy – Thrashing–Other Approaches to DSM–Heterogeneous DSM –Advantages of DSM. **(9L)**

UNIT – IV

Synchronization: Introduction – Clock Synchronization – Event Ordering – Mutual Exclusion – Deadlock – Election Algorithms. Process Management: Introduction-Process Migration– Threads. **(9L)**

UNIT – V

Distributed File System: Introduction – Desirable features of a Good Distributed File System– File Models – File Accessing Models – File Sharing Semantics – File Caching Schemes – File Replication – Fault Tolerance – Atomic Transactions – Design Principles. **(9L)**

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	PO5,PO3	H/H	PS01,PS05	M/H	K2
CO2	PO1	H	PS02	M	K4
CO3	PO4,PO2	M/H	PS03,PS07	M/H	K5

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

TOTAL: 45 PERIODS

Reference Books:

1. Pradeep K Sinha, "Distributed Operating Systems", PHI Learning, 2012.
2. Andrew S Tanenbaum, "Distributed Operating Systems", First Edition, PHI 2002
3. George Coulouris, Gordon Blair, Jean Dollimore, Tim Kindberg, "Distributed Systems - Concepts and Design", Fifth Edition Pearson 2017.
4. Manish Varshney, Shanoo Agarwal, "Concepts of Distributed System", CBS Publisher and Distributors, 2016.
5. Abraham Silberchalz Peter B. Galvin, G.Gagne, "Operating Systems Concepts", Ninth edition, Addison Wesley Publishing Co., 2018.
6. Coulouris George, Dollimore Jean, Blair Gordon, "Distributed Systems- concepts and design", Pearson Education, 2017.

Elective 1: 2.CLOUD COMPUTING

OBJECTIVES:

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization and design of cloud Services
- To be familiar with the lead players in cloud.
- To learn to design the trusted cloud Computing system

L	T	P	C
4	0	0	3

OUTCOMES:

- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Address the core issues of cloud computing such as security, privacy and interoperability.

UNIT I :CLOUD INFRASTRUCTURE

Scalable Computing over the Internet –Technologies for Network based Systems -System Models for Distributed and Cloud Computing –Software Environments for Distributed Systems and Clouds-NIST Cloud Computing Reference Architecture-Cloud Computing and Services Model –Public, Private and Hybrid Clouds –Cloud Eco System -IaaS -PaaS –SaaS (9L)

UNIT II :VIRTUALIZATION STRUCTURES

Implementation Levels of Virtualization -Virtualization Structures –Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices -Virtual Clusters and Resource Management – Virtualization for Data-Center Automation (9L)

UNIT III :CLOUD SYSTEM MODEL

Architectural Design of Compute and Storage Clouds –Layered Cloud Architecture Development – Design Challenges -Public Cloud Platforms-GAE, AWS, and Azure-Inter Cloud Resource Management –VM Management -Resource Provisioning and Platform Deployment -Global Exchange of Cloud Resources -Cloud Security and Trust Management. (9L)

UNIT IV :CLOUD SECURITY -MIDDLEWARE AND TESTING

Parallel and Distributed Programming Paradigms –MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache –Mapping Applications -Programming Support -Google App Engine, Amazon AWS -Cloud Software Environments -Eucalyptus, Open Nebula,OpenStack. CloudSim – Architecture -Cloudlets –VM creation –Broker –VM allocation –Hosts –Data Center. (9L)

UNIT V: CLOUD APPLICATIONS AND CASE STUDIES

Cloud Computing Risk Issues –Cloud Computing Security Challenges –Cloud Computing Security Architecture –Trusted cloud Computing –Identity Management and Access Control –Autonomic Security. Using the Mobile Cloud-Dynamic Resource Allocation Using Virtual Machines for Cloud Computing Environment. (9L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	PO1,PO4	H/H	PS02	M	K2
CO2	PO7,PO5	H/H	PS06,PS05	M/M	K3
CO3	PO2,PO3	M/H	PS03,PS07	M/H	K6

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

TOTAL: 45 PERIODS

REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. Ronald L. Krutz, Russell Dean Vines, “Cloud Security –A comprehensive Guide to Secure Cloud Computing”, Wiley –India, 2010
3. Barrie Sosinsky, “Cloud Computing Bible”, Wiley Publishing Inc., 2011.
4. Ray.J.Rafaels, “Cloud Computing : From Beginning to End” Createspace Independent Publishing, 2015
5. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010.
6. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud” O’Reilly, 2009
7. Zhen Xiao, Weijia Song, And Qi Chen, “Dynamic Resource Allocation Using Virtual Machines For Cloud Computing Environment”, IEEE TRANSACTIONS ON PARALLEL AND DISTRIBUTED SYSTEMS, VOL. 24, NO. 6, JUNE 2013.
8. RajkumarBuyya, Christian Vecchiola, S.TamaraiSelvi, “Mastering Cloud Computing”, TMGH, 2013.
9. Rodrigo N.Calheiros, Rajiv Ranjan, Anton Beloglazov, César A. F. De Rose, and RajkumarBuyya, “CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing Environments and Evaluation of Resource Provisioning Algorithms “, Cloud Computing and Distributed Systems (CLOUDS) Laboratory.
10. <http://www.buyya.com/papers/CloudSim2010.pdf>

11. Elective 1: 3. SOFT COMPUTING

OBJECTIVES

- Upon successful completion of the course, students will have an understanding of the basic areas of Soft Computing including Artificial Neural Networks, Fuzzy Logic and Genetic Algorithms.
- Provide the mathematical background for carrying out the optimization associated with neural network learning.

L	T	P	C
4	0	0	3

OUTCOMES

- Learn about soft computing techniques and their applications
- Analyze various neural network architectures Implement machine learning through neural networks
- Understand perceptrons and counter propagation networks.
- Understand fuzzy concepts and develop a fuzzy expert system to derive decisions
- Analyze the genetic algorithms and their applications and able to write genetic algorithms to solve optimization problem.

UNIT - I NEURAL NETWORKS FUNDAMENTALS

Artificial Neural Network : Basic Concepts of Neural networks - Evolution of Neural networks - Basic Models of Artificial neural network - Terminologies of ANN- McCulloch -Pitts Neuron - Linear separability - Hebb Network - Applications of Neural networks. Supervised learning Network: Introduction – Perceptron Networks – Adaptive Linear Neuron – Multiple Adaptive Linear Neurons – Back propagation Network. (9L)

UNIT – II CATEGORIES OF NEURAL NETWORKS

Associative Memory Networks : Introduction – Training algorithms for pattern association –Auto associative Memory Network – Bidirectional Associative Memory – Hopfield Networks.Unsupervised Learning networks: Introduction – Fixed Weight Competitive Nets - Kohonen Self-Organizing Maps – Learning Vector Quantization – Adaptive Resonance Theory Network. (9L)

UNIT – III BASIC CONCEPTS OF FUZZY SET

Introduction to Classical Sets and Fuzzy Sets: Introduction - Classical sets - Fuzzy Sets. Classical Relation and Fuzzy Relations: - Introduction - Cartesian product of a relation -Classical Relation - Fuzzy Relations. Membership Functions: Introduction - Features of Membership Functions – Fuzzification - Methods of Membership Value Assignments. Defuzzification: Introduction - Lambda-Cuts for Fuzzy Sets - Lambda-Cuts for Fuzzy Relations - Defuzzification Methods. (9L)

UNIT - IV FUZZY ARITHMETIC AND DECISION MAKING

Fuzzy Arithmetic and Fuzzy Measures: Introduction - Fuzzy Arithmetic - Extension principles – Fuzzy measures. Fuzzy Rule Base and Approximate Reasoning: Introduction-Truth values and Tables in fuzzy logic - Fuzzy properties - Formation of rules-Decomposition of rules - Aggregation of Fuzzy rules - Fuzzy reasoning - Fuzzy Inference Systems. Fuzzy Decision Making: Individual Decision Making - Multiperson Decision Making - Multiobjective Decision Making - Multiattribute Decision Making. Fuzzy Logic Control Systems: Introduction - Control System Design - Architecture and Operation of FLC System. (9L)

(9L)

UNIT - V GENETIC ALGORITHMS

Genetic Algorithms : Introduction - Basic Operators and Terminologies in GAs - Traditional Algorithm vs. Genetic Algorithm - Simple GA - General Genetic algorithm - The Schema Theorem - Classification of Genetic Algorithm - Applications of Genetic Algorithm. Applications of Soft Computing : Introduction - A Fusion approach of Multispectral Images with SAR Image for Flood area Analysis - Optimization of TSP using Genetic Algorithm Approach.

(9L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	P01	M	PSO1, PSO5	M/H	K1
CO2	P02, PO3	H/H	PSO2, PSO3	H/M	K3
CO3	PO4	M	PSO4	M	K2
CO4	PO5	M	PSO5	M	K6
CO5	PO2, PO6	H/H	PSO2, PSO6	H/H	K5

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

REFERENCES

TOTAL : 45 PERIODS

1. NiraliPrakashan, “Soft Computing Techniques” Edition: 1st, 2016.
2. Charu C. Aggarwal, “Neural Networks and Deep Learning”, Springer, 2018.
3. Jang and Sun and Mizutani, “Neuro-Fuzzy and Soft Computing”, Pearson India, 2015.
4. Lee Spector, Leigh Sheneman, “Genetic Programming Theory and Practice XVI”, Springer, 2019.
5. Timothy J.Ross, “Fuzzy Sets and Fuzzy Logic with Engineering Applications”, Wiley, 2021.
6. Sean Moriarity, “Genetic Algorithms in Elixir: Solve Problems Using Evolution” The Pragmatic Programmers, N.Y., 2021

ELECTIVE 1: 4 CYBERSECURITY

OBJECTIVES

L	T	P	C
4	0	0	3

- Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization.
- Understand principles of web security and to guarantee a secure network by monitoring and analyzing the nature of attacks through cyber/computer forensics software/tools

OUTCOMES

- Analyze and evaluate the cyber security needs of an organization
- Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
- Measure the performance and troubleshoot cyber security systems

UNIT 1: INTRODUCTION TO CYBER SECURITY

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace.

(9L)

UNIT 2: CYBER SECURITY VULNERABILITIES AND CYBER SECURITY SAFEGUARDS

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

(9L)

UNIT 3: INTRUSION DETECTION AND PREVENTION

Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.

(9L)

UNIT 4: CRYPTOGRAPHY AND NETWORK SECURITY

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer- IPsec.

(9L)

UNIT 5: CYBERSPACE AND THE LAW

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.

(9L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	P05	M	PS02, PSO7	M/H	K2
CO2	P01, PO3	H/H	PS01	H	K6
CO3	PO4	M	PSO4,PO5	M/M	K3

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

TOTAL : 45 PERIODS

Reference Books:

1. “Cryptography and Network Security - Principles and Practice”, William Stallings, Pearson Education, Seventh Edition 2017.
2. Cyber Security Paperback, Prof. AmitGrag, Dr.Krishan Kumar Goyal, First edition, 2019.
3. 3. Cyber Security Paperback, Nina Godbole, SunitBelapure,Wiley, 2011.
4. Cybersecurity for Dummies Paperback, Joseph Steinberg, 2020.
5. “Information and Cyber Security”, Gupta Sarika, Khanna Publishing House, Delhi, 2019

Core 12, Practical 3: Machine Learning using Python -Lab

1. Visualize the dataset using the Python packages

(i) Matplotlib (ii) Seaborn

L	T	P	C
4	0	0	2

2. Implement binning operation for

(i) Numerical data (ii) Categorical data

3. Implement the Linear Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
4. Implement the Logistic Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
5. Write a program to demonstrate the working of the Decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Write a program to implement the Naïve Bayes classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
7. Write a program to implement the k-Nearest Neighbour classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets
8. Write a program to implement the Random Forest classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets
9. Write a program to implement the Neural Network classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets
10. Implement K- Means clustering algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets
11. Implement DBSCAN clustering algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets
12. Implement PCA for dimension reduction and study its impact in classification.
13. Demonstrate the use of cross validation in building a classifier. (use random forest, Naïve Bayes classifiers)
14. Demonstrate the Grid Search method for parameter selection in Random Forest and SVM classifier.

Core 13, Practical 4 : ADVANCED WEB TECHNOLOGY LAB

L	T	P	C
4	0	0	2

1. Working with Web Forms in ASP.Net.
2. Working with HTML Server Controls in ASP.Net.
3. Simple Applications using Web controls:
 - a) Finding factorial value.
 - b) Finding roots of Quadratic Equation.
 - c) Temperature Conversion.
 - d) Login Control.
4. Working with Validation Control.
5. Access data source using ADO.Net.
6. Datalist Link Control.
7. Databinding using dropdownlist control.
8. Databinding using datalist control.
9. Datalist Control templates.
10. Databinding using datagrid.
11. Datagrid Control template.
12. Creating own table format using Datagrid.
13. Creating Web Services in .NET.
14. Creating SOAP Web Services in ASP.Net.
15. Using Proxy class in ASP.Net.
16. Component Based Programming in ASP.Net.
 17. Custom Controls in ASP.Net.
 18. Implementing Security in ASP.Net Web Application

Core 14: DATA SCIENCE & ANALYTICS

OBJECTIVES

- To enable the students to understand the techniques available in handling the voluminous data and to apply the concepts of data analytics to the challenges and issues available on hand.

L	T	P	C
4	0	0	4

OUTCOMES

- Understand the need for the big data analytics
- Appreciate the effectiveness of the techniques and algorithms that are available for handling big data
- Apply the data analytic techniques for their data analysis

UNIT – I INTRODUCTION TO DATA SCIENCE

Introduction: Introduction of Data Science-Getting started with R- Exploratory Data Analysis- Review of probability and probability distributions- Bayes Rule Supervised Learning- Regression-polynomial regression- local regression- knearest neighbors (12L)

UNIT – II UNSUPERVISED LEARNING

Unsupervised Learning- Kernel density estimationk-means- Naive Bayes- Data and Data Scraping Classification-ranking- logistic regression. Ethics- time seriesadvanced regression- Decision trees- Best practicesfeature selection. (12L)

UNIT – III BIG DATA FROM DIFFERENT PERSPECTIVES

Big data from business Perspective: Introduction of big data-Characteristics of big data-Data in the warehouse and data in Hadoop- Importance of Big data- Big data Use cases: Patterns for Big data deployment. Big data from Technology Perspective: History of HadoopComponents of Hadoop- Application Development in Hadoop-Getting your data in Hadoop-other Hadoop Component.(12L)

UNIT – IV INFOSPHERE BIGINSIGHTS

Infosphere Big Insights: Analytics for Big data at rest-A Hadoop-Ready Enterprise-Quality file system-Compression –Administrative tooling-SecurityEnterprise Integration –Improved workload scheduling-Adaptive map reduce-Data discovery and visualization-Machine Analytics (12L)

UNIT – V INFOSPHERE STREAMS

Infosphere Streams: Analytics for Big data in motionInfosphere Streams Basicsworking of Infosphere Streams-Stream processing language-Operators-Stream toolkits-Enterprise class . (12L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	P03	M	PS06, PSO5	M/H	K1
CO2	PO6	H	PS01,PSO4	H/M	K4
CO3	PO5	M	PO3	H	K2

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5–Evaluate, K6 – Create)

TOTAL DURATION: 60 PERIOD

REFERENCES

1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data Hardcover , EMC Education Services, Wiley Publication, 2015
2. Big Data with HadoopMapReduce: A Classroom Approach 1st Edition by RathinarajaJeyaraj , GaneshkumarPugalendhi ,Anand Paul, CRC Press
3. The Data Science Handbook Hardcover – Illustrated by Field Cady, 2017.

Core 15: ADVANCED DIGITAL IMAGE PROCESSING

OBJECTIVES

- To provide complete knowledge on Digital Image

L	T	P	C
4	0	0	4

Processing methods, such as image processing methods in Spatial domain and Frequency domain, Edge detection, Compression, Segmentation, and Morphological concepts, which enable the students to understand the concepts and implement them empirically.

OUTCOMES

- Review the fundamental concepts of a digital image processing system and Analyze images in the frequency domain using various transforms.
- Evaluate the techniques for image enhancement and image restoration. Categorize various compression techniques.
- Interpret Image compression standards, and Interpret image segmentation and representation techniques.

UNIT - I

Fundamentals - The MATLAB Desktop - Using Mat lab Editor /Debugger getting help-saving and Retrieving work session data - Digital Image Representation - Image I/O and Display – Classes and Image Types - M-Function Programming. **Intensity Transformation and Spatial Filtering:** Background - Intensity transformation - Histogram Processing and function Plotting - Spatial filtering - Image processing toolbox standard spatial filters. (12L)

UNIT - II

The 2-D Discrete Fourier transform - Computing and Visualizing the 2-D DFT in MATLAB – Filtering in the Frequency domain - Obtaining frequency domain filters from spatial filters - High pass (sharpening) frequency domain filters. **Image Restoration and Reconstruction:** A model of the image degradation / restoration process - Noise models - Restoration in the presence of Noise only – Periodic Noise reduction using Frequency Domain Filtering – Modeling the Degradation Function - Direct Inverse Filtering - Wiener filtering. (12L)

UNIT - III

Colour image representation in MATLAB - converting to other color spaces - The basics of color image processing - Color transformation - Spatial Filtering of colour images. Working directly in a RGB vector space. **Wavelets:** Background - The fast wavelet transform -Working with wavelet decomposition structures - The inverse wavelet transform- Wavelets in image processing. (12L)

UNIT - IV

Image Compression: Background - Coding Redundancy - Spatial Redundancy - Irrelevant information- JPEG Compression. **Morphological Image Processing:** Preliminaries - Dialation and Erosion - Combining Dialation and erosion - Labelling connected components (12L)

UNIT - V

Image Segmentation: Point, line and edge detection - Line detection using the Hough transform – Thresholding – Region - Based segmentation using the Watershed transform. **Representation and Description:** Background – Representation - Boundary Descriptors. (12L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	P05,PO3	M/M	PS02, PSO3	M/H	K5
CO2	PO2	H	PS05	H	K6
CO3	PO6	M	PO3,PSO6	H/H	K1

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

TOTAL DURATION: 60 PERIOD

Reference Books:

1. Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, “Digital Image Processing Using MATLAB”, Third Edition, Tata McGraw Hill Private Limited, New Delhi, 2011.
2. Anil.K.Jain, “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. S.Jayaraman, S.Essakirajan&T.Veerakumar, “Digital Image Processing”], Second Edition, McGraw Hill, 2020.
4. Rafael C.Gonzalez, Richard E. Woods, “Digital Image Processing”, Fourth Edition, Pearson Education, 2018.

Core 16: PRINCIPLES OF COMPILER DESIGN

OBJECTIVES

L	T	P	C
4	0	0	4

- Discover principles, algorithms and techniques that can be used to construct various phases of compiler.
- Acquire knowledge about finite automata and regular expressions
- Learn context free grammars, compiler parsing techniques.
- Explore knowledge about Syntax Directed definitions and translation scheme

OUTCOMES

- Use the knowledge of patterns, tokens & regular expressions for solving a problem in the field of data mining.
- Understand the application of finite state machines, recursive descent, production rules, parsing, and language semantics.
- Analyze & implement required module, which may include front-end, back-end, and a small set of middle-end optimizations.

UNIT I

Introduction to Compiler: Language Processors – The Structure of Compiler – The Science of Building a Compiler – Application of Compiler Technology - Programming Language Basics. **A Simple Syntax** – Directed Translator: Syntax Definition – Syntax Directed Translation – Parsing – A Translator of Simple Expression – Lexical Analysis – Symbol Table – Intermediate Code Generation. (12L)

UNIT II

Lexical Analysis: The Role of the Lexical Analyzer – Input Buffering – Specification of Tokens– Recognition of Tokens – The Lexical – Analyzer Generator Lex – Finite Automata – From Regular Expression to Automata – Design of a Lexical-Analyzer Generator – Optimization of DFA – Based Pattern Matchers. (12L)

UNIT III

Syntax Analysis: Introduction – Context-Free Grammars – Writing a Grammar – Top-Down Parsing – Bottom-Up Parsing – Introduction to LR Parsing: Simple LR – More Powerful LR Parsers – Using Ambiguous Grammars – The Parser Generator Yacc (12L)

UNIT IV

Syntax Directed Translation: Syntax-Directed Definitions – Evaluation Orders for SDD's – Applications of Syntax Directed Translation – Syntax Directed Translation Schemes **Intermediate-Code Generation:** Variants of Syntax Trees – Three – Address Code – Types and Declarations – Translations of Expressions – Type Checking – Control Flow – Back patching – Switch Statements – Intermediate Code for procedures (12L)

UNIT V

Run-Time Environments: Storage Organization – Stack Allocation of Space – Access to Nonlocal Data on the Stack. **Code Generation:** Issues in the Design of a Code Generator – The Target Language – Address in the Target Code – Basic Blocks and Flow Graph. (12L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	PO1	M	PS05	M	K1
CO2	PO2	M	PS01,PS03	M/H	K4
CO3	PO4,PO5	H/H	PS02	M	K2

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

TOTAL : 60 PERIODS

Reference Books:

1. Alfred V.Aho, Monica S. Lam, Ravi Sethi, Jeffrey D.Ullman, “Compilers –Principles, Techniques and Tools”, Pearson Education Asia, Second Edition, 2014
2. Terence Halsey, Compiler Design Principles, Techniques and Tools, Larsen and Keller Education, 2018
3. Dick Grune, Kees van Reeuwijk, Henri E.BalCerial J.H Jacobs, KoenLangendoen : Modern Compiler Design, Second Edition, Springer 2012.
4. Douglas Thain “ Introduction to Compilers and Language Design” University of Notre Dame, 2019

Core 17: RESEARCH METHODOLOGY

OBJECTIVES

To understand the importance of Research Methodology

To apply the statistical testing to prove the hypothesis

To make use of computer aids to analyze the data, prepare reports and presentations Able to evaluate methodology of teaching

L	T	P	C
4	0	0	4

OUTCOMES

Ability to apply different research approaches and methodologies

Construct and document an appropriate research design

Effectively apply the appropriate computer tools in each stage of research

Ability to perform ICT based Teaching Methods

UNIT I

Introduction - Meaning of Research – Objectives of Research – Types of Research – Motivation of Research – Research approaches – Significance of Research – Research Methods versus Methodology – Research and Scientific method – Research process – Criteria of good Research – Problems encountered by Researchers in India.

Defining the Research Problem: What is a Research problem - Selecting the Problem – Technique involved Defining a problem.

Research Design: Meaning – Need for Research Design – Features of Good Design – Important concept relating to Research design – Different Research designs – Basic Principles of Experimental Designs

(12L)

UNIT II

Sampling Design : Census and Sample Survey – Implications of a sample design – Steps in sample design - Criteria of selecting a sampling procedure – Characteristics of a good sample design – Different types of sample design – How to select a random sample – Random sample from an infinite Universe – Complex random sampling designs.

Measurements and Scaling techniques : Measurement in Research – Measurement scales – Sources of error in Measurement – Test and sound Measurements – Technique of developing measurement tools – Scaling, Meaning of scaling – Scale classification bases – Important scaling techniques – Scale Construction techniques.

(12L)

UNIT III

Chi-Square Test for large samples – Definition of Chi-Square – Limitations of Chi-Square test - Chi-Square test as a test of goodness of fit and as a test of independence – Yate's correction and its applications.

Analysis of Variance (ANOVA): Concept – One way ANOVA – ANOVA in test in Latin Square Design

(12L)

UNIT IV

Data Collection: Methods of Data Collection – Collection of Primary Data – Observation Method – Interview method – Collection of data through Questionnaires – Collection of data through Schedules – Some other methods of data collection – Collection of secondary data – Selection of appropriate method for data collection.

Interpretation and Report Writing: Meaning of interpretation – Why interpretation – Technique of interpretation – Precaution in Interpretation – Significance of Report Writing (12L)

UNIT – V

Introduction – Algorithmic Research Problems – Types of Solution Procedure/ Algorithm – Steps of Development of Algorithm – Steps of Algorithmic research – Design of Experiments and Comparison of Algorithms – Meta Heuristics for Combinational Problems. The Computer – Its role in Research – The Computer and Computer Technology – The Computer System – Important Characteristics - Computer Applications – Computer and Researchers. (12L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	PO5	H	PS03	H	K1
CO2	PO3, PO1	M/H	PS01, PS05	M/M	K3
CO3	PO4	H	PS07	H	K6
CO4	PO3,PO6	H/M	PS04, PS06	H/M	K5

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

TOTAL : 60 PERIODS

Reference Books:

1. C.R.Kothari, “Research Methodology Methods and Techniques”, Second edition, New Age International Publishers, 2020.
2. R.Panneerselvam, “Research Methodology”, PHI, 2009.
3. S.C Gupta and V.K Kapoor, “Fundamentals of Mathematical statistics”, Sulthan Chand & Sons, Delhi, 2020.
4. Deepak Chawla and NeenaSondhi,” Research Methodology: Concepts and Cases”, Vikas Publishing House, 2016.
5. David M.Levine, David F Stephen,e al., “Business Statistics”, Pearson Publisher, 7th edition,2017.
6. Ranjit Kumar “Research Methodology: A Step-by-step Guide for Beginners”, Sage Publications Ltd, 2019.

Elective 2: 1. OPTIMIZATION TECHNIQUES

OBJECTIVES

- To understand the role and principles of optimization techniques in business world.
- To understand the process of problem statement formulation of the business scenario.
- To understand the implementation of various decision making techniques in the process of decision making.
- To gain the techniques and skills on how to use optimization techniques to support the decision making in business world.

L	T	P	C
4	0	0	3

OUTCOMES

- Apply problem solving techniques through OR approaches.
- Formulate the problem using linear programming technique.
- To analyze the optimal solution for the given problem by applying Transportation problems.
- To analyze the strategies with different players through game theory approach.
- To analyze the sequence of jobs to be executed by machines for the given problem.

UNIT – I LINEAR PROGRAMMING PROBLEM (LPP)

Introduction, structure of linear programming model, advantages, general model of Linear programming problem(LPP), examples of LP formulation, graphical solutions of LP problem and Solution of LPP by simplex method.

(9L)

UNIT – II LINEAR PROGRAMMING PROBLEM (LPP)

Artificial variables-two-phase method, Big M method.Duality in linear programming, formulation of dual linear programming and examples.

(9L)

UNIT – III TRANSPORTATION AND ASSIGNMENT PROBLEMS

Mathematical model of transportation problem, methods of finding initial solution (Northwest corner rule, Least cost method, Vogel's approximation method), test for optimality in TP using MODI Method. Mathematical model of assignment problem, Hungarian method for solving assignment problem.

(9L)

UNIT – IV THEORY OF GAMES

Introduction, two-person zero sum games, pure strategies (MinMax and MaxMin principles), mixed strategies. The rules of principles of dominance, algebraic method to solve games without saddle point, graphical methods to solve games.

(9L)

UNIT – V NETWORK ANALYSIS

PERT and CPM, Network construction and determination of critical path, Calculation of ES, EF, LS, LF, TF, FF and IF, Crashing of a project, Scheduling of a project and resource levelling.

(9L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	P02	M	PS01	M	K1
CO2	P01, PO3	H/M	PS02,PSO7	H/H	K6
CO3	PO4,PO7	M/H	PSO4	M	K2
CO4	PO5	M	PSO5,PSO3	M/H	K4
CO5	PO6,	H	PSO2, PSO6	H	K3

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

TOTAL: 45 PERIODS

REFERENCES

1. Operations Theory and Applications, J.K. Sharma, 5th edition, MacMillan publisher India, 2016
2. Operations Research – An Introduction , Taha H A- Pearson Edition ,7th edition,2017
3. An Introduction to Optimization Techniques - Vikrant Sharma, Vinod Kumar Jain, Atul Kumar, Chapman and Hall/CRC, 2021.

Elective 2: 2. MOBILE APPLICATION DEVELOPMENT

OBJECTIVES

- Android Application Development course is designed to quickly get you up to speed with writing apps for Android devices.
- The student will learn the basics of Android platform and get to understand the application lifecycle

L	T	P	C
4	0	0	3

OUTCOMES

- Develop effective user interfaces that leverage evolving mobile devices
- Develop applications using software development kits (SDKs), frameworks and toolkits.
- Implement suitable methods to integrate database and server-side technologies
- Design and develop open source software based mobile application to the given problem.
- Build and deploy competent mobile application to solve the societal/industrial problems

UNIT – I INTRODUCTION

Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in the Business World – Effective use of Screen Real Estate – Understanding Mobile Applications: Understanding Mobile Applications Users – Understanding Mobile Information Design – Understanding Mobile Platforms – Using the Tools of Mobile Interface Design. (9L)

UNIT – II GETTING STARTED WITH ANDROID PROGRAMMING

What is Android – Obtaining the required tools– Anatomy of an Android Application – Components of Android Applications – Activities – Fragments – Utilizing the Action Bar. (9L)

UNIT – III ANDROID UI DESIGN AND LOCATION BASED SERVICES

Views and View Groups – Basic Views – Fragments – Displaying Maps – Getting Location Data – Publishing for Publishing – Deploying APK Files (9L)

UNIT – IV ANDROID MESSAGING AND NETWORKING

SMS Messaging – Sending Email – Networking – Downloading Binary Data, Text files – Accessing Web Services – Performing Asynchronous Call – Creating your own services – Communicating between a service and an activity – Binding activities to services (9L)

UNIT – V FEEDBACK AND OSCILLATOR CIRCUITS

iOS – Obtaining the tools and SDK – Components of XCODE – Architecture of iOS – Building Derby App in iOS – Other useful iOS things – Windows Phone: Getting the tools you need – Windows Phone 7 Project Building Derby App in Windows Phone 7 – Distribution – Other useful Windows Phone Thing (9L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	PO1	H	PS06	M	K1
CO2	PO2, PO3	M/M	PS01,PS05	M/H	K5
CO3	PO4,PO5	H/M	PS02, PS07	H/M	K2
CO4	PO6	M	PS03	H	K6
CO5	PO7	M	PS04	M	K4

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

TOTAL DURATION: 45 PERIOD

REFERENCES

1. Android Application Development All-in-One for Dummies, 3rd Edition, Barry Burd, John Paul Mueller , Wiley Publications ISBN: 978-1-119-66045-3 July 2020
2. McWherter and Scott Gowell, “Professional Mobile Application Development”, 3rd Edition, ISBN: 978-1-118-20390-3, 2012
3. **Beginning Android 4 Application Development**, by Wei-Meng Lee; ISBN: 978-1-1181-9954-1, 2017

Elective 2: 3. MOBILE COMPUTING

OBJECTIVE:

- To impart knowledge to the students about the concepts of Mobile Technologies, Issues and Architecture provided by various Protocols.

L	T	P	C
4	0	0	3

OUTCOMES:

- Understand concepts of Mobile Computing,
- Analyze various protocols used in mobile and wireless communication networks.
- Possess the basic skills in Developing Mobile Application

UNIT 1

Basics of Communication Technologies: Mobile Handsets, Cell Phone Systems, Components of Wireless Communication system, Architecture of Mobile Telecommunication system, Mobile Networking standards, WLANs, Bluetooth Technology **Introduction to Mobile Computing and Wireless Networking:** Mobile Computing, Applications, Characteristics, Structure of Mobile Computing Application, Cellular Mobile Communication, GSM, GPRS, and UMTS. (9L)

UNIT 2

MAC Protocols: Properties, Issues in Wireless MAC Protocols, Fixed Assignment Schemes, Random Assignment Schemes, Reservation Based Schemes. **Support for mobility:** 3 Wireless application protocol (version 1.x) – Architecture, Wireless datagram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless Application Environment, Wireless Markup Language, WMLScript, iMode, SyncML, WAP 2.0, (9L)

UNIT 3

Mobile Network Layer: Mobile IP, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, IPv6, Dynamic host configuration protocol, Mobile ad-hoc networks, Routing **Mobile Transport Layer:** Traditional TCP- Congestion control, Slow start, Fast retransmit/fast recovery, Classical TCP improvements - Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction-oriented TCPTCP over 2.5/3G wireless networks.(9L)

UNIT 4

Mobile Databases: Issues in Transaction Processing- Centralized, Client-Server, Distributed, and Mobile Environment, Data Dissemination, Transaction Processing in Mobile Environment – Atomicity, Consistency, Isolation and Durability Relaxation, Data Replication, Mobile Transaction Models, Rollback Process, Two-Phase commit Protocol, Query Processing. **OS for Mobile Computing:** Basic Concepts, Constraints and Requirements, Mobile Operating systems, Comparative study of Mobile OS. (9L)

UNIT 5

Mobile Application Development and Protocols: Mobile Devices as Web Clients, J2ME, Android Application Development – SDK, Features, Components, Stack Structure, Advantages of Android. Mobile Commerce: Applications of M-Commerce – B2C, B2B, Structure of M-Commerce, Pros and Cons, Mobile Payment Schemes, Security Issues in M-Commerce. (9L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	PO4	H	PS03,PS02	H/M	K2
CO2	PO3, PO2	M/H	PS01, PS07	M/M	K4
CO3	PO5,PO1	H/H	PS01	H	K5

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

TOTAL : 45 PERIODS

REFERENCES:

1. Fundamentals of Mobile Computing, Second Edition, By PATTNAIK, PRASANT KUMAR, MALL, RAJIB · 2015 (chapter 1, 2, 3, 6, 9, 10 and 11)
2. Jochen H. Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2007 (Chapter 8, 9, and 10)
3. Asoke K Talukder, Hasan Ahmed and Roopa R Yavagal, “Mobile Computing : Technology, Applications and Service Creation”, Second Edition, TMH, 2010
4. Raj Kamal, “Mobile Computing”, Second Edition, Oxford University Press, 2012
5. Joseph Anderson, “Mobile Computing: Technology and Applications” Clanrye International publisher, 2

Elective 2: 4. PROFESSIONAL ETHICS

OBJECTIVES

- To understand the concepts of computer ethics in work environment.
- To understand the threats in computing environment
- To Understand the intricacies of accessibility issues
- To ensure safe exits when designing the software projects

L	T	P	C
4	0	0	3

OUTCOMES

- Learn the moral issues and problems in engineering; find the solution to those problems.
- Learn the need for professional ethics, codes of ethics and roles, concept of safety, risk assessment.
- Gain exposure to Environment Ethics & computer ethics; know their responsibilities and rights

UNIT I COMPUTER ETHICS INTRODCUTION AND COMPUTER HACKING

A general Introduction – Computer ethics: an overview – Identifying an ethical issue – Ethics and law – Ethical theories - Professional Code of conduct – An ethical dilemma – A framework for ethical decision making - Computer hacking – Introduction – definition of hacking – Destructive programs – hacker ethics - Professional constraints – BCS code of conduct – To hack or not to hack? – Ethical positions on hacking. (9L)

UNIT II ASPECTS OF COMPUTER CRIME AND INTELLECTUAL PROPERTY RIGHTS

Aspects of computer crime - Introduction - What is computer crime – computer security measures – Professional duties and obligations - Intellectual Property Rights – The nature of Intellectual property – Intellectual Property – Patents, Trademarks, Trade Secrets, Software Issues, Copyright - The extent and nature of software piracy – Ethical and professional issues – free software and open source code. (9L)

UNIT III REGULATING INTERNET CONTENT, TECHNOLOGY AND SAFETY

Introduction – In defence of freedom expression – censorship – laws upholding free speech – Free speech and the Internet - Ethical and professional issues - Internet technologies and privacy – Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk. (9L)

UNIT IV COMPUTER TECHNOLOGIES ACCESSIBILITY ISSUES

Introduction – Principle of equal access – Obstacles to access for individuals – professional responsibility - Empowering computers in the workplace – Introduction – computers and employment – computers and the quality of work – computerized monitoring in the work place – telecommuting – social, legal and professional issues - Use of Software, Computers and Internet-based Tools - Liability for Software errors - Documentation Authentication and Control – Software engineering code of ethics and practices – IEEE-CS – ACM Joint task force. (9L)

UNIT V SOFTWARE DEVELOPMENT AND SOCIAL NETWORKING

Software Development – strategies for engineering quality standards – Quality management standards – Social Networking – Company owned social network web site – the use of social networks in the hiring process – Social Networking ethical issues – Cyber bullying – cyber stalking – Online virtual world – Crime in virtual world - digital rights management - Online defamation – Piracy – Fraud. (9L)

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	PO2	H	PS01	H	K2
CO2	PO4	M	PS02	M	K4
CO3	PO5,PO5	H/H	PS05	H	K5

(L – Low, M – Medium, H – High; K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create)

TOTAL DURATION: 45 PERIOD

REFERENCES

1. Caroline Whitback, "Ethics in Engineering Practice and Research", Cambridge University Press, 2011.
2. George Reynolds, "Ethics in Information Technology", Cengage Learning, 2018
3. Ethics in Computing Joseph Migga Kizza, Springer, Cham, 978-3-319-29106-2, 2019.
4. Ethics in engineering: Mike W. Martin Roland, McGraw Hill, 2017

Core 18, Practical -3: DATA SCIENCE & ANALYTICS USING R LAB

1. R program to create a Sequence of numbers from 20 to 50 and find the Mean of numbers from 20 to 60 and Sum of numbers from 51 to 91.
2. R program to create a Vector which contains 10 random integer values between -50 and +50.
3. R program to get all Prime numbers up to a given number.
4. R program to read the .csv, .xls files and display the contents.
5. R program to use Built-in Mathematical Functions.
6. R program to get the Statistical Summary and Nature of the data of a given data frame.
7. Find the Data Distributions using Box and Scatter Plot using R.
8. Plot the Histogram, Bar Chart and Pie Chart on sample data using R.
9. Plot the Density and the Cumulative Probability Curve for a Normal Distribution with Mean= 2.5 and SD = 1.5 using R.
10. Build the Correlation Matrix using R.
11. Build a Decision Tree Classifier using R.
12. Build a Naïve Bayes Classifier using R.

L	T	P	C
4	0	0	2

Core 19 Mini Project

Mini Project

L	T	P	C
0	0	6	6

Semester IV - Core 20 - Major Project

Major Project

L	T	P	C
0	0	30	16