Syllabus for

2 year Master of Computer Applications Course

(MCA)

(Effective from the Academic Year: 2025-2026)

Khallikote Unitary University

Berhampur

Website:kuu.ac.in

MCA Eligibility

Duration: 2 years (4 semesters)

Eligibility:

All those candidates who have passed bachelor's degree of minimum three years duration in BCA/B.Sc.(IT)/B.Sc.(CS) or equivalent/B.Voc. with Computer as a major subject and with mathematics at 10+2 level or at graduation level.

or

Bachelor Degree in Computer Science & Engineering or equivalent.

or

Any bachelor's degree of minimum three years duration with mathematics at 10+2 level or at graduation level **and** minimum One Year Diploma in Computer Application/Science/IT or equivalent from any recognized University/Institution

Khallikote Unitary University
Syllabus for MCA Course

MCA PROGRAM OUTCOMES

The Master of Computer Application (MCA) is a 2 years course consists of 4 semesters. The course is designed to progress the students' career productively in software industry, academia, research, entrepreneurial pursuit, government, consulting firms and other Information Technology enabled services. On successful completion of MCA degree, the students will be able to apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements. They can also use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. Keeping in view the requirements of the evolving software industry and current research trends, courses such as Internet of Things, Data Science, Cryptography and Network Security and Cloud Computing are included in the course curriculum to provide a good exposure to the students in these state-of-the-art topics.

	SEMESTER	PAPER	SUBJECT	CREDITS	FULL MARKS (100)	
					MID TERM	END TERM
1	I	CS 101	C programming and Data Structure through C	4	20	80
2		CS 102	Database Management System	4	20	80
3		CS 103	Data Communication and Computer Network(DCCN)	4	20	80
4		CS 104	Mathematical Foundation of Computer Science	4	20	80
5		CS 105	Communicative English	4	20	80
6		CS 106	Programming in C & Data Structure Lab.	3		75
7		CS 107	Oracle Lab	3		75
8	II	CS 201	Operating System	4	20	80
9		CS 202	Theory of Computation	4	20	80
10		CS 203	Design and Analysis of Algorithms	4	20	80
11		CS 204	Computer Organization &Architecture	4	20	80
12		CS 205	Object Oriented Programming Using JAVA	4	20	80
13		CS 206	Linux Lab	3		75
14		CS 207	Java Lab	3		75
15	III	CS 301	Compiler Design	4	20	80
16		CS 302	Artificial Intelligence and Machine Learning	4	20	80
17		CS 303	Software Engineering	4	20	80
18		CS 304	Internet of Things(IOT)	4	20	80
19		CS 305	Elective I Cryptography & network security Digital Image Processing(DIP) Big data Analytics	4	20	80
20		CS 306	Python Lab	3		75
21		CS 307	Web Technology Lab	3		75
22			MINI PROJECT	4		100
23	IV	CS 401	Data Science & Analytics	4	20	80
24		CS 402	Software Project Management	4	20	80

25		**CS 403**	**Elective II** **Cloud Computing** **Soft Computing** **Social Network and Analysis**	**4**	**20**	**80**
26			**MAJOR PROJECT**	**10**		**250**
				94	**360**	**2240+360=2600**

SEMESTER-I,II,III,IV
Duration: 3 hrs

20 MARKS MID TERM + 80 MARKS END TERM = 100 MARKS

Pattern of Questions in TERM END Examination

1. There are five Questions in each question paper.
2. Each Question contains two parts carrying 8 marks each with an alternative to be attempted.
3. In Mathematics Foundation in computer science paper, Question no.1 there are 10 Questions each carries 2 marks, from Question no.2 to 5 there are 2 Questions each carries 6 marks with an alternative to be attempted. And Question no.6 carries 12 marks.

Student must secure minimum 40% in Theory paper in TERM END and 50% in practical paper to be declared as pass.

MANNER OF CONDUCT OF EXAMINATION

1. Theory:100 marks

   Duration:3hours

Examination		Marks
a)	Semester end exam.	80
c)	Internal Exam	20
	Total	100

2. Practical: 75 marks

a)	Lab. record -	10
b)	Attendance	05
c)	Practical experiment	40
d)	Viva voce	20
	Total	75

Semester -I

CS-101- C programming and Data Structure through C

Course Outcomes – On completion of the course, students will be able to:

1. Learn about the programming concepts
2. Implement linear and non-linear data structure operations using C
3. To develop algorithms for performing different operations on data structures and implement in C language and its application in different areas of computer science
4. Demonstrate different methods for traversing trees and graphs.

UNIT-I

Introductory Concepts :Overview of programming and programming languages, Types of programming Languages., Introduction to C, Features of C, Structure of C program, C Fundamentals Character Set, Identifiers and Keywords ,Variables and constants , Data types, Type casting.

UNIT-II

Operators and Expressions, Precedence and Associativity , Library Functions, Data Input output statement, Format specifiers, Control Statements, Arrays, String Array, Functions ,Storage classes.

UNIT-III

Pointers, Dynamic memory allocation, Structures and unions, User defined data types (type def), enum, command line arguments,File handling.

UNIT IV

Introduction to data structures. Abstract data type, Stacks and Queues: circular Queue, Priority Queue,Deque, representation and Applications. Linked Lists: Singly linked lists, Linked stacks and queues, Operation on polynomial, Doubly linked list, Circular linked list, Doubly circular linked lists, Dynamic storage Management, Garbage collection and compaction.

UNIT-V

Graphs: Terminologies and representation, Path matrix, Trees: Terminologies and memory representation, Binary trees, Binary search trees, Tree traversing, Operations on binary trees, - Expression manipulations, Threaded binary trees, Height balancing trees, heaps. Sorting techniques: Bubble sort, selection sort, Insertion sort, Heap sort, Searching technique: Linear search and binary search.

Text books:

1. Let us C by Y. B. Kanitkar
2. Programming in ANSI C by E.Balaguruswamy

Reference books:

1.Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, 2008, Universities Press Pvt. Ltd.
2. J. P. Tremblay P.G.Sorenson (Mc Graw Hill)

CS-102: DATA BASE MANAGEMENT SYSTEMS

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

1. Learn the DB concepts and model requirements as ER-model.
2. Able to learn various data models for DataBase.
3. Able to find anomalies and normalize data.
4. Able to write the queries using sql and learn file organization concept in DBMS.
5. Understand the concept of concurrency, its importance in transactions and various recovery techniques.
6. Understand the concepts of distributed, object-oriented and parallel databases.

UNIT-I: Review of file systems, characteristics of database approach, DB system concepts and architecture, data models, schema & subschema, 3-tier architecture, Physical and logical data independence, data base languages: DDL & DML. Data modeling using E-R approach, Reduction of E-R diagrams to tables.

UNIT-II: Hierarchical data model: Basic concepts, tree-structure diagrams, physical and logical database record concepts, data manipulation, and overview of IMS Access & Storage structures.

Network data model : DBTG data structure diagrams concept of set, owner and member records, set membership, Insertion and retention options, data manipulation overview of DBTG DB system.

Relational model : Structures of relational database, Relational algebra, Key Concepts, Integrity Constraints, Concept Of normalization, types of data dependencies, INF, 2NF, 3NF, BCNF, 4NF and 5NF.

UNIT-III : Query processing: basic structure of query, translation of queries Into relational algebra, basic algorithms for executing query operations, use of SQL as a query processing language, simple and nested queries, concept of views, Join relations.

File organization in DBMS: Introduction,File Organization,Sequential File Organization,Indexed Sequential File Organization,Direct File Organization.

UNIT-IV: Concept of data base transaction, transaction states, ACID properties, serializability. Concurrency control in DB Systems: lock based and time-stamp based techniques, two phase commit protocol,Failure and recovery in DB systems, log-based recovery, shadow-paging.

UNIT-V: Distributed databases: concept and Architecture, comparative view of Distributed databases and centralized database, data fragmentation, level of Distributed transparency.

Object oriented databases: object-oriented models, object structure, inheritance, object identity and object containment.

Parallel databases: I/O parallelism, inter query and intra query parallelism, inter operation and intra operation parallelism

Recommended BOOKS:

1. Fundamentals of Database Systems - Elmsary and Navathe, Addison Wesley.
2. Principles of Database Systems - .Ullmari J. D., Galgotia Publications.

Reference BOOKS:

3. Introduction to Database Systems - Bipin C Desai Narosa Publishing House.
4. An Introduction to Database systems-Date C. J. Addison Wisley.

CS-103: Data Communication and Computer network

Course Outcome: Upon successful completion of this course, students will be able to:

1. Explain the architecture and functioning of different network layers and their associated protocols.
2. Compare the OSI and TCP/IP reference models and understand their application in real-world networks.
3. Implement and troubleshoot data link layer protocols and error detection/correction methods.
4. Design and manage network systems using appropriate hardware and software tools, including IP addressing and routing protocols.
5. Utilize and manage network applications and protocols such as HTTP, FTP, email,TELNET, and DNS effectively.

Unit-I

Overview of the Internet: introduction to data communication, network application, Network hardware, Protocol, Layering Scenario, reference models: The OSI Model, TCP/ IP model, Internet history, standards and administration; Comparison of the OSI and TCP/ IP reference model. Physical Layer: data and signals: analog and digital, periodic analog signals, digital signals, transmission impairments, data rate limit, Guided transmission media, unguided transmission media, Wireless transmission, mobile telephone system.

Unit–II

Data Link Layer: Design issues, error detection and correction design issues, elementary data link protocols, CRC codes, sliding window protocols, HDLC, the data link layer in the internet. Elementary Data Link Layer Protocols, sliding window protocols, noisy and noiseless channels.

THE MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless, Bluetooth.

Unit–III

Connecting devices: learning bridges, spanning tree bridges, repeaters, hubs, bridges switches, routers and gateways, definition of multiplexing and types.

Network Layer: Network Layer Design issues, store and forward packet switching, connectionless and connection oriented networks-routing algorithms-optimality principle, circuit and packet switching, definition of flooding and multicast.

Unit– IV

Routing protocols: Shortest Path, Routing uni-cast Distance Vector Routing, RIP, link state protocols, path vector routing. Internetworking: logical addressing, internet protocols, IP address, CIDR, IPv4 addressing, IPv6 Protocol addressing, addresses mapping, ICMP, IGMP,ARP,RARP, DHCP.

Unit-V

Transport Protocols: process to process delivery, UDP, TCP, TCP Sliding Window, TCP Congestion Control, congestion control and quality of service. Application Layer-World Wide Web, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS.

Text Books :

1. "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross.
2. "Data Communications and Networking" by Behrouz A. Forouzan.

References :

1. Computer networks by Tanenbaum, A.S., Pearson Education India.
2. Computer Networks by Bhushan Trivedi, Oxford University Press

CS-104: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Course outcome

After the completion of the course, student will be able to

1. Learn the basic concept of Mathematical logic, Well-formed formulas, and Predicative logic.
2. Able to understand the concept of Relations and Recurrence relation and basics of counting.
3. Able to learn network scheduling problem.
4. Able to understand the concept of sequencing problem.

UNIT I

Mathematical Logic: Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers. Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving.

UNIT II

Relations: Properties of binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Lattices, Hasse diagram. Functions: Inverse Function, Composition of functions, recursive Functions, Lattice and its Properties, Pigeon hole principles and its application.

UNIT III

Recurrence and Counting :Basics of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial and Multinomial theorem, the principles of Inclusion – Exclusion.

Recurrence Relations: Generating Functions, Function of Sequences, Calculating Coefficients of generating functions, Recurrence relations, solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, solution of non homogeneous Recurrence Relations.

UNIT IV

Network scheduling :PERT and CPM with known activity times, critical path analysis, various types of floats, probability consideration in PERT, Transportation problem, degeneracy in transportation problem , Assignment problem.

UNIT V

Sequencing problem: introduction to sequencing problem, flow shop problem, processing and jobs , 2,3 and M machines, general n/m job shop problem .

Game theory: Introduction, Definition payoff, types of game, the Max Min principle, games without saddle point, graphical method for 2xn or mx2 games, Dominance property.

TEXT BOOKS:

1. Mathematical Foundation of Computer Science – ShahnazBathul, PHI.
2. Logic and Discrete Mathematics, Grass Man and Tremblay,Pearson Education.
3."Operations Research", Kanti Swarup, Gupta. P. K. and Manmohan, Sultan Chand and Sons.
4. Operation research by S.D. Sharma , Kedarnath Publication.

REFERENCE BOOKS:

1. Discrete Mathematics and its applications, 6th edition, K.H.Rosen, TMH.
2.Discrete Mathematical Structures, Mallik and Sen, CengageLearning.
3.Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon Cutler Ross, PHI/ Pearson Education.
4.Discrete Mathematics with Applications,ThomasKoshy,Elsevier

CS-105: COMMUNICATIVE ENGLISH

Course Outcomes:

1: Students will be able to articulate the fundamental principles and processes of communication**,** identify and overcome common communication barriers**,** and differentiate between verbal and non-verbal communication methods**..**

2: Students will develop enhanced listening abilities by applying active listening strategies, demonstrating strong comprehension, and participating confidently in public speaking, group discussions, and role-play activities.

3: Students will gain the skills to write professional documents such as emails, memos, business letters, and technical reports, with attention to correct formatting, professional etiquette, and originality by avoiding plagiarism.

4: Students will be able to design and deliver impactful presentations using suitable visual aids and digital tools, while also showcasing a solid understanding of English grammar, including state and event verbs, tenses and aspects, and subject-verb agreement.

5: Students will gain insight into the principles of interpersonal communication, the significance of workplace ethics, and the nuances of cross-cultural communication. They will also develop the ability to communicate effectively in team settings, recognize roles and responsibilities, and make use of collaborative tools and technologies..

Unit 1: BASICS OF COMMUNICATION

1. Introduction to Communication: Definition and Process; Types of Communication: Verbal and Non-verbal; Barriers to Effective Communication
2. Listening Skills: Active Listening Techniques; Barriers to Effective Listening; Listening Comprehension Exercises
3. Speaking Skills: Basics of Pronunciation and Intonation; Public Speaking: Techniques and Practice; Group Discussions and Role Plays

Unit 2: PROFESSIONAL COMMUNICATION

1. Business Writing: Email Writing: Format and Etiquette; Writing Memos and Notices; Business Letters: Inquiry, Complaint, and Job Application Letters; Writing Technical Reports; Avoiding Plagiarism
2. Presentation Skills: Preparing Effective Presentations; Visual Aids: Use of PowerPoint and Other Tools; Delivering Presentations with Confidence
3. Basics of English Grammar: State and Event Verbs; Tense and Aspect; Subject-Verb Agreement

Unit 3: INTERPERSONAL SKILLS

1. Interpersonal Communication: Building Relationships through Communication; Importance of Ethics at the Workplace; Cross-Cultural Communication
2. Teamwork and Collaboration: Effective Team Communication; Roles and Responsibilities in a Team; Collaborative Tools and Technologies
3. Interview Skills: Preparing for an Interview; Common Interview Questions and Answers; Mock Interviews and Feedback

Unit 4: ENHANCING LANGUAGE SKILLS

1. Reading Comprehension: Techniques for Effective Reading; Critical Reading and Analysis; Reading Technical and Non-Technical Texts
2. Vocabulary Building: Strategies for Learning New Words; Using Context Clues; Technical Vocabulary for Computer Science
3. Writing for the Web: Writing Blogs and Articles; Social Media Communication; Writing Content for Websites

UNIT 5: WRITING SKILLS

- Email Writing (Formal & Informal),Resume and Cover Letter Writing, Paragraph and Essay Writing, Technical Description and Report Writing, Writing Abstracts, Minutes of Meeting, Summarizing and Note Making

TEXT BOOKS:

1. "Technical Communication" by Mike Markel
2. "English for Technical Communication" by Aysha by Aysha Viswamohan
3. "Effective Technical

Communication" by M Ashraf Rizvi

Reference Books:

1. "Technical Communication**"** by Meenakshi Raman and Sangeeta Sharma – Oxford University Press

2.“English for Technical Communication**"** by K. R. Lakshminarayanan

CS 106 : C PROGRAMMING & DATA STRUCTURE LAB.

(C Language)

Objective : This is the first programming language subject student will learn. This subject will teach them programming logic, use of programming instructions, syntax and program structure. This subject will also create foundation for student to learn other complex programming languages like C++, Java etc.

CS 12 - C Programming

1 **An Overview of C**
1.1 A Brief History of C
1.2 C is middle-level Language
1.3 C is a Structured Language
1.5 The structure of a C Program.
1.7 Compilation & Execution of C. Program on Dos & Linux

2 **Variables, Data Types, Operator & Expression**
2.1 Character Set
2.2 C Token
2.3 Identifier & Keyword
2.4 Constant
2.5 Data Types in C
2.7 Operator & Expression
2.8 Precedence & Associability of Operators.
3 **Console I/O**
3.2 Character input & Output
3.3 String Input & Output.
3.4 Formatted Input/Output (scanf/printf)
4 **Control Statement**
4.2. Selection Statements
If, Nested if, if-else-if,
The Conditional Expression, switch
4.3. Iteration Statements
For loop, while loop, do-while loop
5 **Pointers**
5.3. The basics of Pointer
5.4. The Pointer operator
5.5. Application of Pointer
5.6. Pointer Expression
5.7 .Declaration of Pointer, Initializing Pointer
5.8. Pointer Arithmetic
5.10. Pointer to Pointer
6 **Array & String**
6.1 . Single Dimension Arrays
Accessing array elements, Initializing an array
6.2 Multidimensional Arrays
Initializing the arrays, Memory Representation
Accessing array elements
6.3 . Passing Single Dimension array to Function
6.4 . Array & Pointer
6.5 . Array of Pointer
6.6 String Manipulation Functions

7 **Function**
7.1. Introduction
7.2. Arguments & local variables
7.3. Returning Function Results by reference &
Call by value
7.4. Recursion
8 **Storage Class & Scope**
8.1. Meaning of Terms
8.2. Scope - Block scope & file scope
8.3. Storage Classes
Automatic Storage, Extern Storage, Static
Storage, Register Storage
9 **Structure, Union, Enumeration & typedef**
9.1. Structures
Declaration and Initializing Structure,
Accessing Structure members, Structure
Assignments, Arrays of Structure, Passing
Structure to function, Structure Pointer
9.2. Unions
11 **File handling**
11.1. Introduction
11.2. Defining & Opening a File
11.3. Closing a File
11.4. Input/Output Operations on Files
11.5. Error Handling During I/O Operation
11.7. Command Line Arguments.
11.8. Programs on data structure
Stacks: various operations on stack
Queues: various operations on queue
Sorting Algorithms: Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort
Searching Algorithms: Linear Search, Binary Search

1. Data Structures Using C" by Reema Thareja
2. "Fundamentals of Data Structures in C" by Horowitz, Sahni, and Anderson-Freed
3. "Data Structures Through C" by Yashavant Kanetkar

Text Books
1. C: The Complete Reference: Herbert Schildt
2. Let us C Solutions: Y. Kanetkar
3. "Programming in ANSI C" by E. Balagurusamy

Reference Books:
1. Spirit Of "C": Moolish Kooper.
2. Programming in C : S. Kochan.
3. C Programming Language: Kernighan & Ritchie.
4. C Programming: A Modern Approach" by K.N. King

CS-107: DBMS LAB. (ORACLE)

INTRODUCTION TO MANAGING DATA:

Database concept, DBMS, characteristics of DBMS, RDBMS, characteristics of RDBMS, E. FT Codd's Rule.

INTRODUCTION TO ORACLE:

Characteristics Of Oracle :Various tools of oracle, Data types, creating a table, create a table from another table, copy the structure, inserting data into tables, updating the contents of a table, delete operators, many facts of the select command. modifying the structure of the table, dropping the table and truncate the table:

Data Constraints : Column level, table level constraint, null value concept, primary key constraint, unique key constraint, check constraint, foreign key constraint.

Arithmetic operators used in oracle, logical operators, relational operator,, pattern matching,

oracle functions, grouping data from tables,, joining the table, types of joining, sub queries, types of sub query, sub queries, set operations: union, Intersect, minus clause.

View, creating a view, advantage, limitation, dropping a view, Data control language : Grant revoke. Transaction control language : Commit, save point and rollback., sequence

INTRODUCTION TO PL/SOL :

Introduction, advantages of PL/SQL,Architecture, PL/SQL syntax, understanding the PL/SQL block structure, PL/SQL data types, Attributes:%type, %rowtype, control statements.

Cursors : Definition, types of cursor, explicit cursor, explicit cursor management-, explicit cursor, cursor mgt, cursor for loop, cursor for update, implicit cursor

stored procedure, declare of a procedure, types of parameter, dropping a procedure.

Function : Definition, declaration, how to execute a oracle function. Exception handing, ^

Database Triggers : Introduction, Definition, difference between trigger and-procedure, types of triggers, syntax for creating triggers, programs on trigger,dropping a trigger.

Recommended Books:

1. Understanding ORACLE Perry J & Later J
2. SQL & PL/SQL programming Scott Urman
3. SQL & PL/SQL programming Language Ivan Byrass

SECOND SEMESTER

CS-201: OPERATING SYSTEM

Course outcome: After the completion of the course, the student will be able to:

1. Describe the role of operating system and explain the different types of operating system.
2. Explain process management and compare the performance of various process scheduling algorithms.
3. Discuss different memory management techniques.
4. State the conditions that lead to deadlock and apply deadlock prevention, detection, avoidance algorithms.
5. Discuss various types of Disk scheduling Algorithm.

UNIT-I

Operating system concepts, evolution of operating systems, multi-programming, multiprocessing, time sharing, real-time & multi-tasking, operating system services, file system management: directory structures, file allocation and access methods, file protection.

UNIT-II

Process management: CPU scheduling & schedulers, CPU scheduling techniques: Pre-emptive and non-preemptive scheduling, FIFO, SJF, Round Robin, Priority Scheduling, Multi-level queues, performance evaluation of scheduling algorithms.

UNIT-III

Memory management: Contiguous and non-contiguous allocation schemes MFT, MVT, swapping, memory fragmentation, Dynamic memory allocation, paging, virtual memory, page replacement algorithms: FIFO, LRU, OPTIMAL, Segmentation.

UNIT-IV

Disk scheduling: FCFS, SSTF, Scan, C-Scan Look, C-Look sector Queuing. Inter-process Communication, Process synchronization, Mutual exclusion, Semaphore and its implementation monitor.

UNIT-V

Concept of Deadlock, necessary conditions for deadlock, Resource allocation graph, deadlock prevention, deadlock avoidance, Banker's Algorithm and deadlock detection and recovery techniques.

Text BOOKS:

1. Operating System Concept- Galvino & Silverschatz (Addison Wesley)
2. Operating System Concepts-J.L. Peterson & A. Silverschatz (Add. Wesley)

Reference Books:

3. Modern Operating System – A. S. Tanenbaum (PHI, 1995)
4. Operating Systems – Concept & Design (Milan Milenkovic) (MGH, 1992)
5. An Introduction to Operating Systems- H. M. Deitel (Addison Wesley, 1984)

CS-202:THEORY OF COMPUTATION

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

1. Understand the overview of the theoretical foundation of computer science from the perspective of formal languages.
2. Able to understand regular language and expression in the context of computation and compiler. Understand and design the deterministic and nondeterministic machines.
3. Able to understand context free language.
4. Understand the concept of push down automata and pumping lemma for CFLs.
5. Understand the concept of Recursively enumerable languages, Turing machine, undecidability and Post Correspondence Problem.

UNIT-I

Mathematical Preliminaries: Sets, Functions and Relations, Graph and Trees, Proof Techniques, Three Basic Concepts: Languages, Grammars, and Automata, Finite Automata: Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Equivalence of NFA and DFA, Finite Automata (FA) with €-Moves, Conversion of FA with €-Moves to FA without €-Moves, Minimization of DFA.

UNIT-II :

Regular Expression, Regular Expression to FA, FA to Regular Expression using Arden's Lemma, Algebraic Laws of Regular Expression, Regular Grammar, Properties of Regular Languages: The Pumping Lemma for Regular Languages, Closure Properties of Regular Languages, Decision Properties of Regular Languages.

UNIT-III :

Context Free Languages (CFL), Context Free Grammars (CFG), Sentential Forms,Leftmost Derivation, Rightmost Derivation, Parse Tree, Ambiguous Grammar, Simplification of Context Free Grammar, Chomsky Normal Form (CNF), Greibach Normal Form (GNF).

UNIT-IV :

Pushdown Automata (PDA), From PDA to CFG, From CFG to PDA,Properties of Context Free Languages: The Pumping Lemma for CFLs. Closure Properties of CFLs, Decision Properties for CFLs, Context Sensitive Language (CSL), Linear Bounded Automata (LBA).

UNIT-V :

Recursively Enumerable Languages (RELs), Recursive Languages (RLs), Turing Machine Models, Universal Turing Machine, Chruch-Turing Thesis, Undecidabilty, Halting Problem, Post Correspondence Problem (PCP), Primitive Recursive Functions.

TEXT BOOKS:

1. Introduction to Automata Theory, Languages and Computation, John E. Hopcroft, Rajeev Motwani, and Jeffery D. Ullman, Pearson Education.
2. An Introduction to Formal Language and Automata, Peter Linz,Narosa Publishing House.

REFERENCE BOOKS:

1. Theory of Computation, KLP Mishra & N. Chandrasekharan, PHI.
2. Automata Thoery by P.K Srimani

CS-203 : DESIGN & ANALYSIS OF ALGORITHM

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

1. Study different types of asymptotic notations that are used to analyze the running time of different algorithms and solve recurrences.
2. Apply divide and conquer approach.
3. Learn graph theory, shortest path problems and construction of Minimum Spanning Tree.
4. Design paradigms like Dynamic Programming, Greedy methods and Activity selection problem.
5. Learn the concepts of Backtracking method and Branch and Bound technique.
6. Learn different String Matching algorithms and P, NP and NP-Complete problem, NP-Hard completeness problem.

UNIT I: Algorithm Analysis – Time Space Tradeoff, Analysis Of Algorithm Efficiency, Asymptotic Notations – Conditional asymptotic notation , Removing condition from the conditional asymptotic notation , Recurrence equations – Solving recurrence equations

UNIT II: Divide and Conquer Approach: Merge Sort, Quick sort, Graph Theory: graph traversal,- DFS and BFS, Strassen's algorithm for Matrix Multiplications. Topological Sort, Algorithm for Kruskal's and Prim's for finding Minimum cost Spanning Trees, Dijkstra's and Bellman Ford Algorithm for finding Single source shortest paths. Floyd – Warshall algorithm for all pair shortest paths.

UNIT III: Dynamic Programming: Dynamic Programming,Elements of Dynamic Programming, Matrix Chain Multiplication, Longest common subsequence and optimal binary search trees problems. Greedy Algorithms: Elements of Greedy strategy, An activity selection problem, Huffman Codes, A task scheduling problem,knapsack problem,traveling salesman problem.

UNIT IV: Backtracking: General Method, 8 Queens Problem, sum of subsets, graph coloring, Hamiltonian problem, Branch and Bound: introduction, knapsack problem, Assignment problem, travelling salesman problem.

UNIT V: String matching: The naïve String Matching algorithm, The Rabin-Karp Algorithm, The Knuth-Morris Pratt algorithm. NP-Complete Problem: Polynomial-time verification, NP-Completeness- class P, class NP and NP completeness problem, NP Hard completeness problem.

TEXT BOOK :

1.Introduction to the Design and Analysis of Algorithms, Anany Levitin : Pearson Education, 2003.

2. Fundamentals of Computer Algorithms, Horowitz and Sahni, .

REFERENCE BOOKS :

1.Algorithms",Second Edition, Prentice Hall of India Pvt. Ltd, 2003.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education, 1999.

CS-204 : COMPUTER ORGANIZATION AND ARCHITECTURE

Course outcome: At the end of this course student will be able to

1. To study design of an elementary basic computer
2. Describe functional units of digital system and explain how arithmetic and logical Operations are performed by computers
3. Describe the operations of control unit and write sequence of instructions for carrying out simple operation using various addressing modes.
4. To introduce pipelining and multi-processor
5. Design various types of memory and its organization. Describe the various modes in which IO devices communicate with CPU and memory.

Unit I:

Introduction to Computer Organization,Basic structure of computer,Functional units: Input, Output, Memory, ALU, Control Unit,Von Neumann architecture, Map Simplification, Flip Flops, ,Combinational and sequential circuits (brief overview)

Unit II:

Digital Logic and Data Representation,Number systems (Binary, Octal, Decimal, Hexadecimal),Fixed and floating-point representation,Binary arithmetic: Addition, subtraction, multiplication, division,Boolean algebra, logic gates, truth tables.

Unit III: Processor and Control Unit, CPU architecture,, Instruction cycle (Fetch, Decode, Execute), Arithmetic Micro operations, Logic Micro operations, Shift Micro operations and Arithmetic logic shift unit, Instruction formats and types, Addressing modes, Hardwired vs Microprogrammed control,RISC vs CISC architecture

---

Unit IV: Memory Organization, Memory hierarchy: Cache, RAM, ROM, Virtual Memory,Cache memory organization and mapping techniques,Associative memory,Memory interleaving,Memory management and protection,Input-Output Organization,I/O interfacing techniques, I/O mapping: Memory-mapped I/O vs I/O-mapped I/O,Interrupts and interrupt handling, DMA (Direct Memory Access)

Unit V: Parallel Processing and Advanced Concepts,,Introduction to parallel processin, Pipelining: Instruction and Arithmetic,Multiprocessors and multicomputers,Flynn's taxonomy,Introduction to multicore and GPU architecture.

Text Books:

1. "Computer System and Architecture" (3rd edition), Mano M., Prentice Hall of India.
2. "Computer Organization and Architecture" (2nd edition), Stalling W., Prentice Hall of India.
3. "Computer Organization and Design", Pal Chauduri. P (1994), Prentice Hall of India, New Delhi.
4. "Introduction to Digital Computer Design"(4th edition), New Delhi.

Reference Books:

1. J. P. Hayes "Computer Architecture and Organization" McGraw Hill Education India.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "ComputerOrganization", 5th Edition, Mc Graw-Hill Education India
3. A.S. Tananbaum "Structured Computer Organization" Pearson Education.

CS-205: Object Oriented Programming using JAVA

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

1. Understand the concepts of OOP as well as the purpose and JVM concept.
2. Identify classes, objects, members of a class.
3. Understand the concept of Inheritance and Polymorphism.
4. Learn multithreaded applications with synchronization and File stream classes.
5. Able to develop and understand exception handling and Applet programming.
6. Able to design GUI based applications i.e. AWT and Swing.

unit-I

JAVA BASICS: comparison of procedure oriented approaches and object oriented concepts, basic concept of OOPS, , History of Java, Java buzzwords, JVM architecture, Data types, Variables, Scope and life time of variables, , operators, control statements, type conversion and casting, simple java program, arrays.

Unit II: Class & Objects : Class fundamentals, creating object's, introducing methods, static methods, constructors, types of constructors, constructor overloading, this keyword, garbage collection, finalize method, constructors, Static Method String and String Buffer Classes. INHERITANCE AND POLYMORPHISM: Basic concepts, Types of inheritance, Member access rules, Usage of this and Super key word, Method Overloading, Method overriding, Abstract classes, Usage of final keyword.

Unit -III

PACKAGES AND INTERFACES: Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces.

I / O STREAMS: Concepts of streams, Stream classes- Byte and Character stream, Reading console Input and Writing Console output, File Handling.

Unit -IV

EXCEPTION HANDLING: Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords, Built-in Exceptions, Creating own Exception classes.

MULTI THREADING: Concepts of Thread, Thread life cycle, creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication.

AWT CONTROLS: The AWT class hierarchy, user interface components- Labels, Button, Text Components, Check Box, Check Box Group, Choice, List Box, Panels – Scroll Pane, Menu, Scroll Bar. Working with Frame class, Colour, Fonts and layout managers.

Unit -V

EVENT HANDLING: Events, Event sources, Event Listeners, Event Delegation Model (EDM), Handling Mouse and Keyboard Events,

SWINGS: Introduction to Swings, Hierarchy of swing components. Containers, Top level containers, Swing components.

APPLETS: Life cycle of an Applet, Differences between Applets and Applications, Developing applets, simple applet.

Text Books:

1. Herbert schildt (2010), The complete reference, 7th edition, Tata Mc graw Hill, New Delhi

2.Programming with Java, E. Balagurusamy, McGraw-Hill Education, 6th Edition.

Reference Books:

1. Java Complete Reference, Herbert Schildt.
2. Web Enabled Commercial Application Development using Java 2.0, Ivan Bayross.

CS-206 LINUX & SHELL PROGRAMMING LAB:

INTRODUCTION :

What is operating system, functions of O.S., types of O.S, Basic concepts of multi user system, Introduction to Linux, characteristics of Linux, component of linux, SHELL, types of SHELL, File naming, file system, types of users in linux, difference between DOS file system, linux file system.

Simple Directory Commands! pwd, mkdir, cd, rmdir,ls command, various options of ls.

Simple File Commands : cat, cp, rm, mv and other commands, wild card characters, file access permission, chmod command,cmp,comm.,diff,wc,vi editor, types of editor, various commands of vi editor,Pipes and filters : Standard files, redirection, filters (grep, wc, head,sort,unique,,tr,tail commands) environment variables,ps command,kill,running jobs background, communication commands,su command,set command, .profile command.

INTRODUCTION TO SHELL PROGRAMMING :

Creation of shell program, executing the shell script, echo command, creating variables referencing variables, expr command, various control statements in linux, break and continue commands, array handling in linux, floating point operations, programs on shell script.

Text Books:

1. UNIX- Concepts and applications,By: Sumitabha Das TMH publication

Reference Books:

2. Using UNIX – Special Edition ,PHI publication
3. The UNIX programming Environment,By: Kernighan and Pike, PHI publication

Session 1:Data types, variables and operators

Exercise 1: Write a program in Java to implement the formula (Area = Height x width) to find the area of a rectangle. Where Height and Width are given

.Exercise 2: Write a program in Java to find the result of following expression (Assume a = 10, b = 5)

i) (a « 2) + (b » 2)

ii) (a)||0»0)

iii)(a + b*10G}/10

iv)a & b

Exercise2 : Write a program in Java to find the average of marks you obtained in your 10+2 class.

Exercise3: Write a program in Java that calculate sum,average and mean deviation of n number

Exercise4: Write a program in Java that will print square and cubes of odd numbers from 0 to 50. the o/p should be

Original number square cube

Session 2: Statements and array

Exercise 1: Write a program in Java to find A*B where A is a matrix of 3x3 and B is a matrix of 3x4, Take the values in matrixes A and B from the user.

Exercise 2: Write a program in Java to compute the sum of the digits of a given X integer, Remember, your integer should not be less than the five digits, (e.g., if input is 23451 then sum of the digits of 23451will be 15)

Session 3: Class and Objects

Exercise 1: Write a program in Java with class Rectangle with the data fields width, length,' area and colour. The length, width and area are of double type and colour is of stang type .The methods are sel_ lenglh (} , sel_width (}, set_ colourQ, and find_ area Mj. Create two object of Rectangle and compare their area and colour. If area and color both are the same for the objects then display "Matching Rectangles", otherwise display "Non matching Rectangle".

Exercise 2: Create a class Account with two overloaded constructors. The first constructor is used for initializing, the name of account holder, the account number and the initial amount in the account. The second constructor is used for initializing the name of the account holder, the account number, the addresses, the type of account and the current balance. The Account class is having methods Deposit( ), Withdraw (), and Get_Balance(), Make the necessary assumption for data members and return types of the methods. Create objects of Account class and use them.

Session 4:

Inheritance and polymorphism

Exercise 1: Write a Java program to show that private member of a super class cannot be accessed from derived classes.

Exercise 2: Write a program in Java to create a Player class. Inherit the classes Cricket _Player, Football _Player.and Hockey_ Player from Player class.

Exercise 3: Write a class Worker and derive classes Daily Worker and Salaried Worker from it. Every worker has a name and a salary rate. Write method comPay(hit hours) to compute the week pay of every worker. A Daily Worker is paid on the basis of the number of days s/he works. The Salaried Worker gets paid the wage for 40 hours a week no matter what the actual hours are. Test this program to calculate the pay of workers. You are expected to use the concept of polymorphism to write this program.

Exercise 4: Write a Java program based on method overloading and method overriding.

Session 5: Package and Interface

Exercise 1: Write a program to make a package Balance in which has Account class with Display_Balancc method in it. Import Balance package in another program to access Display __Balance method of Account class.

Exercise 2: Create an Interface having two methods division and modules. Create a class, which overrides these methods.

Exercise 3: Write a program in Java which implements interface Student which has two methods Display_Grade and Atrendance for PG_Students and UG_Students (PG_Students and UG_Students arc two different classes for Post Graduate and Under Graduate students respectively).

Session 6: Exception Handling

Exercise I: Write a program in Java to display tnc names and roll numbers of students. Initialize respective array variables for 10 students. Handle ArraylndcxOutOfBoundsExeption, so that any such problem doesn't cause illegal termination of program.

Exercise 2: Write a Java program to enable the user to handle any chance of divide by zero exception.

Exercise 3: Create an exception class, which throws an exception if operand is non-numeric in calculating modules. (Use command line arguments)

Session 7: Multithreading

Exercise 1: Write a Java program to create five threads with different priorities. Send ""two threads of the highest priority to sleep state. Check the aliveness of the threads and mark which thread is long lasting,

Exereise 2: Write a program to launch 3 threads. each thread increments a counter 'variable. Run the program with synchronization,

Exm:ise 3: Write a program for generating 2 threads, one for printing even numbers and the other for printing odd numbers.

Session 8: Reading, Writing and String handling in Java

Exercise 1: Writ a program in Java to create a String object. Initialize this object with your name. Find the length of your name using the appropriate String method. Find the character 'a' is in your name or not; if yes find the number of times 'a' appears in your name. Print locations of occurrences of 'a' .Try the same for different String objects.

2: Write a program in Java for String handling which performs the following:

i) Checks the capacity of StringBuffer objects.

ii) Reverses the contents of a string given on console and converts the resultant string in upper case,

iii) Reads a string from console and appends it to the resultant string of it

Exercise 3: Write a program in Java to read a statement from console, convert it into "-"upper case and again print on console,

Exercise 4: Write a program in Java, which takes the name of a file from user, read contents of the file and display it on the console.

Exercise 5: Write a Java program to copy a file into another file.

Session 9; Applets and it's applications

Exercise 1: Write a Java Applet program which reads your name and address in different text fields and when a button named find is pressed the sum of the length of characters in name and address is displayed in another text field. Use appropriate colors, layout to make your applet look good.

Exercise 2: Create an applet which displays a rectangle/string with specified colour & coordinate passed as parameter from the HTML file.

Session 10:programs on AWT and Swings

Third Semester

CS-301 COMPILER DESIGN

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

1. Acquire knowledge of compiler and different phases of the compiler.
2. Understand syntax analysis and Basic parsing technique.
3. Understand LR parser and constructing SLR - canonical LR and LALR parsing tables.
4. Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.
5. Understand the concept of Code optimization, loop optimization and code generation from DAG's.

UNIT-I:

IntroductiontoCompilers:

Translators and Compilers, phases of a compiler, compiler writing tools, Lexical and syntactic structure of a language, multi-pass compliers, cross complier. Lexical analysis: role of lexical analyzer, design of lexical analyzer, regular expressions, finite state machine, transition diagram, regular expression, conversion of NDFSM to DFSM, regular expression to FSM.

UNIT-II

Syntax Analysis: syntactic specification of programming language Context free grammars, derivations and parse trees, capabilities of context free grammars - Basic parsing techniques : Shift reduce parsing - Operator precedence parsing - Top Down parsing - Predictive parsers- Automatic construction of efficient parsers.

UNIT-III

LR Parsers - constructing SLR - canonical LR and LALR parsing tables - using ambiguous grammars -automatic parser generator - implementation of LR parsing tables. **Syntax Directed Translation :**Schemes -implementation - intermediate code - postfix notation - parse tree and syntax trees - three address code -quadruples and triples - translation of assignment statements - boolean expression - postfix translations -translation with a top down parser.

UNIT-IV

Symbol tables, contents data structures, representing scope information, run-time storage administration, implementation and storage allocation of simple stack allocation schemes and block structured languages, error detection and recovery, lexical phase errors, syntactic phase errors, semantic errors.

UNIT-V

Introduction to code optimization, principle sources of optimization, loop optimization, DAG representation of basic blocks, global data flow analysis, code generation, problems in code generation, register allocation and assignment, code generation from DAG's, Peephole optimization.

TEXT BOOK :

1. Principles of Compiler Design, Narosa 25th reprint, Alfred Aho, Jeffrey D. Ullman.

REFERENCE :

1.Ravi Sethi "Compiler Design-Principles Techniques and Tools",16th reprint,Pearson Education

CS-302 Artificial Intelligence and Machine Learning (AI & ML)

Course Outcome:

1. Understand foundational AI concepts including definitions, history, Strong vs. Weak AI.
2. Apply AI techniques for problem-solving, such as search algorithms (BFS, DFS, A*, minimax) and knowledge representation (propositional, predicate, fuzzy logic).
3. Analyze fundamental ML paradigms including supervised and unsupervised learning.
4. Demonstrate classification and clustering techniques.
5. Evaluate models and methods for feature selection and dimensionality reduction.
6. Understand strengths and limitations of ML algorithms.
7. Design and implement ML algorithms for real-world applications.

UNIT-I: Introduction to A.I. concepts:

AI problem solving, defining an AI problem as a state space search, Problem-Solving Using Search, Uninformed and Informed Search ,production systems, search space control/ Depth first, breadth first search, Heuristic search : Hill climbing, best first, minimax search Alpha-beta cut offs.

UNIT-II: Knowledge representation:

First Order Predicate Logic, rule-based systems, forward and backward reasoning, conflict resolution, semantic nets, frames, scripts, conceptual dependency.

UNIT-III: Scope of A.I.:

Natural language processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Spell Checking, statistical parsing methods.

UNIT IV: **Introduction to Machine Learning**: Types of Human Learning, What is Machine Learning, Types of Machine Learning, Application of Machine Learning, Issues in ML Concept learning tasks.,**Supervised Learning**: Exploring algorithms like linear regression, logistic regression, and decision trees. Feature Selection and Extraction, **Unsupervised Learning**: Delving into clustering techniques such as k-means and hierarchical clustering .

UNIT V: Modelling and Evaluation:
Select model, training model-holdout, k-fold cross validation, bootstrap sampling, model representation and interpretability-under-fitting, over-fitting, bias-variance tradeoff.

TEXT BOOK

1. Artificial Intelligence,Elaine Rich, Kevin Knight, Tata McGrawHill
2. Machine Learning by SaikatDutt, S.Chandramauli, Amit Kumar Das
3. 2. Dr M Gopal, Applied Machine learning, McGraw Hill Education Private Limited

Recommended Book

1.E. Alpayidin, Introduction to Machine Learning, Prentice Hall of India (2005)
2.T. Hastie, RT Ibrashiran and J. Friedman, The Elements of Statistical Learning, Springer 2001
3.Artificial Intelligence – A modern approach , Stuart Russel, Peter Norwig, Pearosn Education.

CS-303 : SOFTWARE ENGINEERING

Course outcome: After the completion of the course, the student will be able to:

1. To have an insight into large-scale software development process.
2. To have an appreciation for the use of an engineering approach to software development
3. Able to learn different types of software testing and testing strategies.
4. To learn approaches for software cost estimation, building reliable and quality software systems.

UNIT-I

Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, RAD,SRS documentation.

Unit-II: Software Design

Data Flow Diagrams, Basic Concept of Software Design, Architectural Design, and Low-level Design: Modularization, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO).

Unit III: Software Design using UML

Unified Modeling Languages (UML): Introduction to Unified Modeling Language (UML), Static and Dynamic Models, UML Diagrams, UML Class Diagrams-Types, Structural Diagrams- Class, Object, Component, Deployment Diagrams, Behavioral Diagrams-Activity, Use Case, State Chart ,Collaboration, Sequence Diagrams, UML Extensibility.

Unit-IV: Software Testing

Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing,Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit-V: Software Maintenance

Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

BOOKS RECOMMONDED:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

Reference books:

4. Pankaj Jalote, Software Engineering, Wiley.
5. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh,"Software Engineering", Cengage Learning.

CS-304 INTERNET OF THINGS

Course Outcome: At the end of course, the student will be able to understand

1. Explain the architecture of internet of Things and demonstrate the different technologies for IoTs.
2. Discover the various network protocols used in IoT.
3. Analyze the architecture of Arduino and Raspberry Pi.
4. Create Small IoT Applications using Sensors.
5. Define the role of big data, cloud computing and data analytics in a typical IoT system.

UNIT-1 Introduction: Definition Foundations – Challenges and Issues - Identification - Security. Components in internet of things: Control Units – Sensors – Communication modules –Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks –Mobile Internet – Wired Communication-IoT Platform Overview-Raspberry pi-Arduino boards.

UNIT-2: IoT Protocols: Protocol Standardization for IoT-M2M and WSN Protocols-SCADA and RFID Protocols-Issues with Iot Standardization-Protocols-IEEE 802.15.4-BACNet ProtocolZigbee,Architecture - Network layer – APS Layer – Security.

UNIT 3 :Resource Management in the Internet of Things: Clustering - Software Agents - Data Synchronization - Clustering Principles in an Internet of Things Architecture - The Role of Context - Design Guidelines -Software Agents for Object – Data Synchronization- Types of Network Architectures - Fundamental Concepts of Agility and Autonomy-Enabling Autonomymand Agility by the Internet of Things - The Evolution from the RFID-based EPC Network to an Agent based Internet of Things- Agents for the Behaviour of Objects.

UNIT 4: Case Study and IoT Application Development: IoT applications in home-infrastructuressecurityIndustries- IoT electronic equipments. Use of Big Data and Visualization in IoTIndustry 4.0 concepts - Sensors and sensor Node –Interfacing using Raspberry Pi/Arduino- Web Enabled Constrained Devices.

UNIT-5: Web of Things: Web of Things versus Internet of Things-Architecture Standardization for WoT-Platform Middleware for WoT- WoT Portals and Business Intelligence-Cloud of Things.

Text Books:

1. Honbo Zhou, "The Internet of Things in the Cloud:A Middleware Perspective" –– CRC Press-2012.
2. Dieter Uckelmann, Mark Harrison, "Architecting the Internet of Things", Springer-2011.
3. Arshdeep Bahga, Vijay Madisetti, "Internet of Things (A Hands-On-Approach)", VPT, 2014.
4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

References:

1. Luigi Atzori, Antonio Lera, Giacomo Morabito, "The Internet of Things: A Survey", Journal on Networks, Elsevier Publications, October, 2010.
2. http://www.theinternetofthings.eu/what-is-the-internet-of-things.

ELECTIVE –I

CS-305 CRYPTOGRAPHY AND NETWORK SECURITY

Course outcome: After successful completion of this course, the students should be able to

1. Learn various encryption techniques.
2. Learn authentication requirements, function and digital signature.
3. Learn intrusion detection, password management.
4. Able to learn various principles for firewall design.

UNIT- I: Introduction :

OSI Security Architecture - Classical Encryption techniques - Cipher Principles - Data Encryption Standard

- Block Cipher Design Principles and Modes of Operation
- Evaluation criteria for AES - AES Cipher - Triple DES - Placement of Encryption Function – Traffic Confidentiality.

UNIT-II :Public key Cryptography:

Key Management – Diffie – Hellman key Exchange- Elliptic Curve Architecture and Cryptography- Introduction to Number Theory- Confidentiality using Symmetric Encryption – Public Key Cryptography and RSA.

UNIT-III: Authentication and Hash Function:

Authentication requirements – Authentication functions – message Authentication Codes – Hash Functions- Security of Hash Functions and MACs- MDS message Digest algorithm- secure Hash Algorithm- RIPEMD- HMAC Digital Signatures- Authentication Protocols- Digital Signature Standard.

UNIT-IV: Network Security:

Authentication Applications: Kerberos- X.509. Authentication Service- Electronic Mail Security – POP- S/MIME- IP Security- Web Security.

UNIT-V : System Level Security:

Intrusion Detection- password management. Viruses and related threats- virus counter measures- Firewall Design Principles- Trusted Systems.

TEXT BOOK:

2. Cryptography and Network Security- Principles and Practices, William Stallings, Prentice Hall of India Third Edition, 2003.

REFERENCES:

1. Cryptography and Network Security, Atul Kahale, Tata McGraw-Hill, 2003.
2. Applied Cryptography, Bruce Schneier, John Wiley & Sons Inc., 2001.
3. Security in Computing, Charles B. Pfleeger, Shari Lawrence Pfleeger, Third Edition Pearson Edition, 2003.

DIGITAL IMAGE PROCESSING

UNIT - 1 : Introduction to Digital Image Processing, Image Sensing and Representation.

- What is Digital Image Processing? Fundamental steps in Digital Image Processing. Components of an Image Processing System.,Elements of Visual Perception, Image Sensing and Acquisition:Fundamentals of CCD camera, Fundamentals of Scanner.Image Sampling and Quantisation :Basic Concepts of Sampling and Qunatisation,,Representing Digital Images, Spatial ami Gray-level ,Aliasing and Moire Patterns, Zooming and Shrinking Digital Images.Some basic relationships between pixels:Neighborhood, Adjacency, Connectivity, Boundaries, Distance Measures, Image operations on pixel basis,

UNIT-II:

Image Enhancement:

A.In the Spatial Domain :Basic Gray Level Transformations ,Image negatives, Log Transformations, Power-low Transformation, Piecewise Linear Transformation functions., Histogram Processing ,Histogram "Equalization, histogram matching, use of Histogram statistics for Image enhancement,Spatial Filtering , Smoothing Linear filters, order-statistics filters.Sharpening spatial filters , The Gradient, The Laplacian,

In the Frequency Domain:Introduction to the Fourier Transform and the frequency domain, The one-dimensional Fourier transform and its inverse, the two-dimensional OFT and its inverse, filtering in the frequency domain, correspondence between filtering in the spatial and frequency domain,Smoothing frequency-domain filters , Ideal Lowpass filters, Butterworth lowpass filters, Gaussian lowpass filters.,Sharpening frequency domain filters , Ideal hiphpass filters, Butterworth highpass filters, Gaussian Highpass filters,Homomorphic filtering.

UNIT - III : Image Restoration :A model of the Image Degradation/restoration process,Noise models ,Spatial and frequency properties of Noise, Noise probability functions, periodic noise, estimation of Noise parameters,Restoration in the Presence of Noise only – special filtering,Mean filters, order-statics filters and adoptive filters.,Periodic Noise reduction by frequency domain filtering,Bandreject filters, Bandpass filters, notch filters.

Minimum Mean-square error restoration (Wiener filtering, Constrained least square filtering, Geometric transformations, Binary Image analysis ,Thresholding,, Morphological processing,Dilation, erosion, opening and closing, hit-or-miss transformation, Skeletonisation.

UNIT-IV : Color image processing : Color models ,The RGB color model, the CM4 and CM4K color models, the HSI color model,Color transformations ,Formulation, color complements, color slicing, tone and color corrections, Histogram processing.,Smoothing and sharpening ,Color segmentation ,Segmentation in HSI color space, segmentation in RGB vector space, color edge detection.,Wavelets and multi resolution processing ,Multi resolution expansions, wavelet transforms in one dimension, the fast wavelet transform,Wavelet transforms in two dimensions, wavelet packets.

UNIT-V : Image compression : Fundamentals ,Coding redundancy, interpixel redundancy, psycho-visual redundancy, fidelity criteria,Image compression models ,Source encoder the decoder a Channel encoder and decoder,Elements of information theory :,Measuring information,. the information cftannfel, fundamental coding theorems, using info theory,Error-free compression :Variable - length coding, LZW coding, Bit-plane coding, lossless predictive coding,Lossy compression ,Lossy predictive coding, transform coding, wavelet

coding,Video compression standards ,JPEG; MPEG, etc.,Digital images being used irt common computer- based applications like medical image processing, remote sensing, document image processing, etc.

BOOKS:

1. Digital Image Processing (2/e), R.C. Gonzalez and R.E. Woods (Pearson Edu [lpe]/PHI)
2. Digital Image Processing and Analysis, B. Chanda and D. Dutta Majumdar (PHI),

REFERENCES :

1. Fundamentals of Digital Image Processing, Anil K. Jain (PHI).

Big Data Analytics

Course Outcomes

By the end of the course, students will be able to:

- Understand and apply big data concepts and technologies.
- Work with Hadoop and the broader Hadoop ecosystem.
- Use NoSQL databases effectively.
- Perform data analytics using Spark.
- Develop end-to-end Big Data solutions.

Unit I: Introduction to Big Data : Big Data, Definition and characteristics (Volume, Variety, Velocity, Veracity, Value),Types of data: Structured, Semi-structured, Unstructured,Challenges with Big Data,Traditional vs Big Data analytics,Applications of Big Data in various domains

Unit II: Hadoop Ecosystem: Overview of Hadoop,HDFS (Hadoop Distributed File System): Architecture and components**,**MapReduce Programming Model**,**YARN (Yet Another Resource Negotiator)**,**Hadoop Ecosystem Components: Hive, Pig, Sqoop, Flume, Zookeeper

Unit III: NoSQL Database: Introduction to NoSQL**,**Types: Key-value, Document, Column-family, Graph**,**Comparison between RDBMS and NoSQL**,**Cassandra: Architecture, Data Model**,**MongoDB: CRUD operations, indexing

Unit IV: Data Processing Using Apache Spark: Introduction to Apache Spark,Spark Core Concepts: RDD, DataFrames, DAG**,**Spark SQL and DataFrames**,**Spark MLib for machine learning**,**Spark Streaming for real-time analytics

Unit V: Big Data Tools and Applications: Introduction to Data Lakes**,**Basics of data warehousing with Big Data**,**Real-time data processing with Kafka**,**Big Data analytics in cloud (AWS, Azure, Google Cloud basics)**,**Case Studies: Social media analytics, healthcare, finance

Recommended books:

1.Big Data: Principles and Paradigms Rajkumar Buyya, Rodrigo N. Calheiros, Amir Vahid Dastjerdi, Publisher: Morgan Kaufmann

2. Hadoop: The Definitive Guide: • Hadoop architecture, HDFS, MapReduce, YARN, Hive, Pig,Publisher: O'Reilly Media

3**. Big Data Fundamentals:** Concepts, Drivers & Techniques *Authors:* Thomas Erl, Wajid Khattak, Paul Buhler

4. Learning Spark: Lightning-Fast Big Data Analysis ,*Authors:* Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia

Cs-306 Python Programming

Unit 1: Basics of Python

1. Write Python programs to demonstrate variables, data types, input/output.
2. Write programs using operators, expressions, and type conversion.
3. Demonstrate decision-making statements (if, if-else, nested if-else).

Unit 2: Loops and Functions

4. Use loops: while, for, nested loops.
5. Program to use break, continue, pass statements.
6. Define and call user-defined functions, use built-in functions.
7. Demonstrate default, keyword, and variable-length arguments.
8. Use recursive functions.

Unit 3: Data Structures in Python

9. Perform operations on strings (slicing, searching, replacing, etc.).
10. Demonstrate lists, tuples, sets, and dictionaries with operations.
11. Use list comprehensions and dictionary comprehensions.

Unit 4: Object-Oriented Programming

12. Classes, __init__ method,self, Create classes and objects, use constructors and destructors.,Demonstrate inheritance, method overriding, and polymorphism.
13. Use encapsulation and abstraction. File Handling and Modules:Read from and write to text files.Use CSV file operations.Import and use built-in modules (e.g., `math`, `random`, `datetime`).Create and use custom modules.

Unit 5: Exception Handling Database & SQL

Use try-except blocks.Raise and handle user-defined exceptions. Databases and SQL ,Use the Create, Read, Update, and Delete operations to manage databases,Python Libraries (Introductory Basic use of **NumPy** arrays and operations.Create simple plots using **matplotlib**.Basic **Pandas** DataFrame operations (if aligned with data science stream).

□ Recommended Textbooks:

- **"Python Programming: Using Problem Solving Approach"** by Reema Thareja
- **"Learning Python"** by Mark Lutz
- **"Python Crash Course"** by Eric Matthes

CS 307: Web Technology Lab

Unit I: HTML (Structure and Semantics)

Create a simple HTML page using basic tags: headings, paragraphs, links, images.
Design a web page using lists, tables, and forms.
Embed multimedia content (audio/video).
Use HTML5 semantic tags (header, footer, section, article, etc.).

Unit II: CSS (Styling the Web)

What is CSS?,Advantages of CSS over inline styles,CSS Syntax and Selectors,Types of CSS: Inline, Internal, External,Text properties: color, font, text-align, text-decoration,Background properties: background-color, background-image,Box Model: margin, padding, border, width, height,Display and Visibility,Create a web layout using **Flexbox** and **Grid**.

Unit III: JavaScript (Client-Side Scripting)

JavaScript- Introduction, features of JS, structure of JS, simple programming, Obtaining User Input with prompt Dialogs, Operators (arithmetic, Decision making, assignment, logical, increment and decrement)
Control Structures - if… else selection statement, while, do… while repetitions statement, for statement, switch statement, break and continue statements, reserved keywords
Functions – program modules in JavaScript, programmer defined functions, function definition, Random-number generator, scope rules, global functions, recursion, JavaScript: Arrays. .
Unit IV: Manipulate the DOM: change content, style dynamically.Form validation using JavaScript (e.g., checking empty fields, email format). The Form Object, Accessing Forms within JavaScript, Accessing Form elements,About <input> element objects, Properties of Form Object, Methods of Form Object, Label Element Object, Text Input Object, Properties of Text Input Object,Methods of Text Input Object, Password Input Object, Hidden Input Object,Textarea Element Object,Properties of Textarea Element Object,Button Element Object, Checkbox Input Object,Properties of Checkbox Input Object, Image Input Object, Radio Input Object,

Unit V: Event handling: onClick, onChange, onSubmit. Design a responsive personal portfolio website using HTML, CSS, and JavaScript.Build a simple interactive web application (e.g., calculator, quiz, to-do list).

Text Books:

1. *HTML & CSS: Design and Build Websites* by Jon Duckett
2. *Eloquent JavaScript* by Marijn Haverbeke
3. 1. Internet & World Wide Web- H. M. Deitel, P.J. Deitel, A. B. Goldberg-Third Edition
4. 2. Web Programming –Chris Bates – Third edition.(Wiley)

REFERENCE BOOKS

1. Programming World Wide Web by RW Sebesta (Pearson)
2. An Introduction to Web Design+Programming by Wang &Katia(Pearson)

MINI PROJECT (100 MARKS)

Fourth Semester

Data science and Analytics

Course Outcomes

By the end of this course, students will be able to:

- Understand data science concepts and tools.
- Preprocess and visualize real-world datasets.
- Apply basic ML models for analytics and predictions.
- Interpret model results and evaluate performance.

Unit I: Introduction to Data Science: What is Data Science?**,**Data Science vs. Data Analytics vs. Machine Learning**,**Data Science Lifecycle**,**Applications of Data Science: Healthcare, Finance, Social Media, etc.**,**Roles: Data Scientist, Data Analyst, Data Engineer

Unit II: Data Preprocessing and Wrangling: Types of Data: Structured, Unstructured, Semi-structured**,**Data Collection and Cleaning**,**Handling Missing Data**,**Outlier Detection and Treatment**,**Data Transformation: Normalization, Standardization,Feature Engineering and Feature Selection

Unit III: Exploratory Data Analysis (EDA) and Visualization: Descriptive Statistics: Mean, Median, Mode, Variance, Standard Deviation**,**Correlation and Covariance**,**Data Visualization Tools: Matplotlib, Seaborn, Plotly**,**EDA Techniques: Boxplots, Histograms, Heatmaps

Unit IV: Statistical Analysis and Inference: Probability Basics**,**Probability Distributions: Normal, Binomial, Poisson**,**Hypothesis Testing: t-test, z-test, Chi-square test, ANOVA**,**Confidence Intervals and p-values

Unit V: Machine Learning for Data Science

- Supervised vs. Unsupervised Learning
- Algorithms: Linear Regression, Logistic Regression, Decision Trees, KNN
- Clustering: K-Means, Hierarchical Clustering
- Model Evaluation: Accuracy, Precision, Recall, F1-Score, Confusion Matrix, ROC Curve
- Overfitting and Cross-validation

Recommended books:

1.Doing Data Science" by Cathy O'Neil and Rachel Schutt, • O'Reilly Media

2. An Introduction to Statistical Learning, *Authors:* Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Publisher: Springer

CS-402 SOFTWARE PROJECT MANAGEMENT

Course outcomes

1. This course on Software Project Management highlights Software Project planning and management. Software Process and Metrics
2. Project Planning and Risk Management
3. Software Quality Assurance and Software Configuration Management

UNIT I - BASIC CONCEPTS:Product Process and project—Definition—Product life Cycle: Prototype Development Phase, Alpha Phase, Beta Phase, Production &Maintenance Phase— Project Management concepts, Process Framework, Project Planning Software Life Cycle,Models, Artifacts of the Project Management Process.

UNIT II-UMBRELLA—Software Configuration Management: Process and activities, Configuration audit, Metrics in SCM, Tools & automation –Software Quality Assurance: Quality Control & Quality Assurance, Tools, Measures of SQA Success–Risk Management: Risk Management Cycle, Risk Identification, Quantification, Monitoring, Mitigation, Metrics in Risk Management.

UNIT III - PROJECT MANAGEMENT PROCESS AND ACTIVITIES In-Stream activities - Project initiation: activities, Outputs, Quality Records, completion criteria –Project Planning and Tracking: Components, activities specific to Project tracking— Project Closure: Effective closure Process issues, Metrics for Project Closure.

UNIT IV–ENGINEERING ACTIVITIES IN PROJECT LIFE CYCLE Software requirement Gathering: Inputs and start criteria, Dimensions, steps, Output & Quality records, Skill sets, Challenges, Metrics for Requirement Phase – Estimation : Phases of Estimation, Methodology, Models for size estimation, Challenges, Metrics for Estimation Process —Design and Development Phases-Project Management in Testing & Maintenance Phase.

UNIT V- EMERGING TRENDS IN PROJECT MANAGEMENT Globalization Issues in Project management : Evolution, Challenges, Models – Impact of the internet on Project Management: Effect of internet on Project Management, managing project for internet, Project management activities – People Focused Process Models: People centric models, P-CMM, other people focussed Models.

TEXT BOOKS 1. Ramesh Gopalaswamy, “Managing and globa Hill.Tenth Reprint 2011.(Revised)

REFERENCES

1. Roger S.Pressman, “Software Engineering - A Practitioner’s Approach”, 7th Edition McGraw Hill, 2010.(Revised).

2.Humphery Watts, “Managing the Software Process”, Addision Wesley, 1989.(Revised).

3. Wheelwright and Clark: “Revolutionizing product development”, The Free Press, 1993 l Software Projects”, Tata McGraw

ELECTIVE –II

CS-403 CLOUD COMPUTING

Course outcome: After successful completion of this course, the students should be able to
1. Understand the concepts of Cloud Computing, key technologies, strengths and limitations of cloud computing.
2. Develop the ability to understand and use the architecture to compute and storage cloud, service and models.
3. Apply suitable virtualization concept.
4. Describe the best practices in cloud computing and understand how cloud computing might evolve in future.
5. Understand the concept of SOA, SOA business and IT services.

UNIT – I

Introduction: Definition , vision of cloud computing, cloud computing reference model, characteristics and benefits of Cloud computing, disadvantages of cloud computing, challenges ahead, web 2.0, Service oriented computing, utility oriented computing, computing platforms and technologies.

UNIT – II

Cloud computing Architecture , IaaS, PaaS, SaaS, Types of cloud, economics of cloud, open challenges, security , trust and privacy ,Computing on Demand (CoD) – Cloud sourcing, organisational aspects, defining identity as a services, Compliance as a service, elements of parallel computing, elements of distributed computing, parallel versus distributed computing.

UNIT – III

Cloud Offerings: Information Storage, Retrieval, Archive and Protection - Cloud Analytics Testing under Cloud - Information Security - Virtual Desktop Infrastructure - Storage Cloud.
Cloud Management: Resiliency – Provisioning - Asset Management - Cloud Governance - High Availability and Disaster Recovery - Charging Models, Usage Reporting, Billing and Metering.

UNIT – IV

Cloud Virtualization Technology: Virtualization Defined , characterstics of virtualised environment, execution virtualization, other types of Virtualization, virtualization and cloud computing, understanding Hypervisor Management Software ,pros and cons of virtualization VMware: full virtualization, Virtualized Data Center.

UNIT – V

Cloud and SOA: SOA Journey to Infrastructure - SOA and Cloud - SOA Defined - SOA and IaaS - SOA-based Cloud Infrastructure Steps - SOA Business and IT Services.
Cloud management, cloud security: brokered cloud storage access, encryption,Auditing and compliance , identity protocol standards, security mapping, cloud application.

Text Book: 1. Cloud Computing Bible, Barry Sosinsky, Wiley
2. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg, Wiley

Reference Books:
1. Cloud Computing, Roger Jennings, Wiley India
2. Cloud Computing Explained, John Rhoton, Recursive Press
3. Cloud Computing for Dummies, Judith Hurwiz, Wiley Publishing.

Soft Computing

Course outcome:

1. Understand the fundamental concepts of soft computing, including its components: fuzzy logic, neural networks, and genetic algorithms.
2. Apply fuzzy logic and reasoning to handle uncertainty and solve real-world problems using fuzzy inference systems.
3. Design and implement artificial neural networks for pattern recognition, classification, and prediction problems.
4. Apply genetic algorithms for optimization problems and understand the working of evolutionary computation techniques.
5. Integrate fuzzy logic, neural networks, and genetic algorithms to develop hybrid intelligent systems for solving complex computational problems.

UNIT-I

Neural Networks-1(Introduction & Architecture) Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks.Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.

UNIT-II

Neural Networks-II (Back propagation networks) ,Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting back propagation training, applications

.

UNIT-III

Fuzzy Logic-I (Introduction) Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion

UNIT-IV

Fuzzy Logic –II (Fuzzy Membership, Rules) Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

UNIT-V

Genetic Algorithm(GA) Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications

TEXT BOOKS:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications” Prentice Hall of India.
2Siman Haykin,”Neural Netowrks”Prentice Hall of India
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.
5. Kumar Satish, “Neural Networks” Tata Mc Graw Hill

SOCIAL NETWORK ANALYSIS

Course Outcomes: At the end of the course, a student will be able to:

CO1: Describe the levels of SNA and network measures.

CO2: Outline various network growth models and different rank methods.

CO3: Illustrate different community structures and link prediction models.

CO4: Explain cascade behavior in networks.

CO5: Predict and recommend in online social networks

UNIT -I

INTRODUCTION: Introduction, Applications, Preliminaries, Three Levels of SNA, Historical Development, Graph Visualization Tools

NETWORK MEASURES: Network Basics, Node Centrality, Assortativity, Transitive and Reciprocity, Similarity, Degeneracy.

UNIT -II

NETWORK GROWTH MODELS: Properties of real-world networks, Random network model, Ring Lattice Network Model, Watts Strogatz model. Preferential Attachment model, Price's model, Local-world network growth model,

LINK ANALYSIS: Applications, Signed networks, Strong and weak Ties, Link analysis and algorithms, Page Rank, Personalized Page Rank.

UNIT -III

COMMUNITY STRUCTURE IN NETWORKS: Applications, Types of communities, Community detection methods, Disjoint community detection, overlapping community detection, local community detection, community detection vs community search, evaluation.

UNIT -IV

LINK PREDICTION: Applications, temporal changes in a network, Problem definition, Evaluating link prediction networks, Heuristic Models, probabilistic Models.

CASCADE BEHAVIOR AND NETWORK EFFECTS: Preliminaries, Cascade model, case study, Probabilistic cascades, epidemic models, Independent cascade models, Cascade prediction.

UNIT -V

GRAPH REPRESENTATION LEARNING: Machine learning pipelines, Intuition behind representation learning, benefits, criteria of GRL, GRL pipelines, representation learning methods.

TEXT BOOKS:

1. Social Network Analysis, TanmoyChakraborty, Wiley, 2021

REFERENCE BOOKS:

1. Network Science, Albert-LazzloBarabasi
2. Social Network Analysis: Methods and Applications, Stanley Wasserman, Katherine Faust

MAJOR PROJECT -250 MARKS

CS-401 Data Science and Analytics (prepared by Asha Madam)

Course Outcome:

1. Equip students with knowledge of fundamentals concepts in machine learning.
2. Ability to analyse and validate different learning algorithms.
3. Fine tune machine learning algorithms and evaluate models generated from data.

UNIT-**I:**
Introduction to Machine Learning: Types of machine learning, Applications of Machine learning. Tools in machine learning, Machine learning activities, Exploring structure of data. Modeling and Evaluation: Selecting a model, training a model, model representation and interpretability, evaluating performance of a model,

UNIT-II:

Final: Feature Engineering,feature transformation, feature subset selection,
Probability: Conditional probability, Bayes rule, Random variables, Discrete distributions: Bernoulli distributions, Binomial distributions, Poisson distribution
Continuous distribution: Uniform distribution, Gaussian distribution

UNIT-III:

Supervised Learning –Classification, Regression, Example of supervised learning, classification model, classification learning steps, common classification algorithms – random forest, SVM, common regression algorithms, Naive Baye's classification.
UNIT-IV:

Unsupervised Learning –Clustering, pattern finding using association rules, Unsupervised learning versus supervised learning, applications of unsupervised learning, clustering and its types, Apriori algorithm for association rule learning,DBSCAN algorithm
UNIT-V:

Neural Network: Understanding the biological neuron, exploring artificial neuron, types of activation functions, early implementation of artificial neural network, architectures of neural network, learning process in artificial neural network, backpropagation.

Textbooks:

1: Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, "Machine Learning", Pearson Education 2: C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2010.

Reference Books:

1. J. Friedman, T. Hastie, and R. Tibshirani.The elements of statistical learning.Vol. 1, no. 10. New York: Springer series in statistics, 2001.
2. S. Shalev-Shwartz, and S. Ben-David. Understanding machine learning: From theory to algorithms. Cambridge university press, 2014.