

**Syllabus for**  
**2 year Master of Computer Applications Course**  
**(MCA)**  
**(Effective from the Academic Year: 2024-2025)**



**Khallikote Unitary University**

**Berhampur**

**Website: [kuu.ac.in](http://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.

SL No.	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	Computer Organization & Architecture	4	20	80
3		CS 103	Operating system	4	20	80
4		CS 104	Software Engineering	4	20	80
5		CS 105	Mathematical Foundation of Computer Science	4	20	80
6		CS 106L	Linux O.S Lab	3		75
7		CS 107L	Programming in C & Data Structure Lab.	3		75
8	II	CS 201	Database Management 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	Data Communication & Computer Networks	4	20	80
12		CS 205	Core JAVA	4	20	80
13		CS 206L	Core Java Lab	3		75
14		CS 207L	DBMS Lab (Oracle)	3		75
15	III	CS 301	Compiler Design	4	20	80
16		CS 302	Data Mining and Data warehousing	4	20	80
17		CS 303	Advance java	4	20	80
18		CS 304	MIS	4	20	80
19		CS 305	Internet of Things(IOT)	4	20	80
20		CS 306L	OSP lab (PHP & Python)	3		75
21		CS 307L	Web designing lab	3		75
22			MINI PROJECT	4		100
23	IV	CS 401	Data Science and Machine Learning	4	20	80
24		CS 402	Cryptography & network security(Elective I)Soft Computing(Elective II)	4	20	80
25		CS 403	Cloud Computing(Elective I)Interactive Computer Graphics(Elective II)	4	20	80
26			MAJOR PROJECT	10		250
27				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 both MID TERM and END TERM and 50% in practical paper to be declared as pass.

# 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.An introduction to data structures with Applications. J. P. Tremblay P.G.Sorenson (Me Graw Hill)

Data Structures using C & C+ + Langsman, Augensteing & Tanenbaum (PHI)

2. Programming in ANSI C by E.Balaguruswamy

3.Data Structure using C by D.Anil Kumar

4.Let us C by Y. B. Kanitkar

5.Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, 2008, Universities Press Pvt. Ltd.

## **CS-102: 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:**

Digital Logic Circuits: Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Sequential Circuits., Flip Flop, counter, Integrated Circuits, Decoder, Multiplexers, Registers, Shift Registers, Binary counter, Memory unit. Data Representation: Data types, Complements, Fixed and Floating Point Representation, Other binary codes and error Detection codes.

### **UNIT -II**

Register Transfer and Micro operations: Register Transfer language, Register transfer, Bus and Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations and Arithmetic logic shift unit. Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycles, Memory Reference Instructions, Input, Output and Interrupts, Design of Accumulator logic.

### **UNIT -III**

Programming the Basic Computer: Introduction, Machine Language, Assembly Language, The Assembler, Programming Arithmetic and Logic Operations, Subroutines, and input - output ,Programming. Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

### **UNIT -IV**

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC. Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline. Computer Arithmetic: Addition and Subtraction, Multiplication algorithms, Division Algorithms, Floating point arithmetic operations, decimal arithmetic unit, and decimal arithmetic operations.

### **UNIT -V**

Input -Output organization: Peripheral Devices, I/O output interface, Asynchronous data transfer, Modes of transfer, Priority Interrupt, DMA, Input output Processor, Serial Communication. Memory Organization: Memory Hierarchy, Main Memory, Cache Memory.

### **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, "Computer Organization", 5th Edition, Mc Graw-Hill Education India
3. A.S. Tananbaum "Structured Computer Organization" Pearson Education.

## **CS-103: 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
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.

### **BOOKS:**

1. Operating System Concept- Galvino & Silverschatz (Addison Wesley)
2. Operating System Concepts-J.L. Peterson & A. Silverschatz (Add. Wesley)
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-104 : 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, Pseudo Codes, Flow Charts, 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 and Software Project Management**

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 RECOMMENDED:**

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.
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-105: 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  $2 \times n$  or  $m \times 2$  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. Elements of Discrete Mathematics- A Computer Oriented Approach, C.L.Liu, D.P. Mohapatra, 3rd edition, TMH.
4. Discrete Mathematics for Computer Scientists & Mathematicians, second edition, J.L.Mott, A. Kandel, T.P. Baker, PHI
5. "Operations Research", Kanti Swarup, Gupta. P. K. and Manmohan, Sultan Chand and Sons.
6. 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, Cengage Learning.
3. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon Cutler Ross, PHI/ Pearson Education.
4. Discrete Mathematics with Applications, ThomasKoshy, Elsevier.

## **CS-106L 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

## **IT 107L: 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 Form 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

## **10 C Preprocessor**

- 10.1. Introduction
- 10.2. Preprocessor Directive

## **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

## **Text Books and References:**

1. C: The Complete Reference: Herbert Schildt
2. Let us C Solutions: Y.P. Kanetkar
3. Spirit Of "C": Moolish Kooper.
4. Programming in C : S. Kochan.
5. C Programming Language: Kernighan & Ritchie.
6. Programming in C: R. Hutchison.
7. Graphics Under C: Y. Kanetkar

# Semester - II

## CS-201: 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, 1NF, 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

### BOOKS:

1. Fundamentals of Database Systems - Elmsary and Navathe, Addison Wesley.
2. Principles of Database Systems - .Ullmari J. D., Galgotia Publications.
3. Introduction to Database Systems - Bipin C Desai Narosa Publishing House.
4. An Introduction to Database systems-Date C. J. Addison Wisley.

# **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  $\epsilon$ -Moves, Conversion of FA with  $\epsilon$ -Moves to FA without  $\epsilon$ -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 (REs), Recursive Languages (RLs), Turing Machine Models, Universal Turing Machine, Church-Turing Thesis, Undecidability, 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 Theory 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 :**

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

### **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.
3. Fundamentals of Computer Algorithms, Horowitz and Sahni, .
4. Introduction to. Algorithms, Gormen, Leiserson and Rivest : Prentice Hall of India.

## **CS-204 ; DATA COMMUNICATION AND NETWORKS**

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

1. Explain basic concepts of computer networks, OSI reference model and data transmission.
2. Learn data encoding and communication techniques, error detection techniques and understand the concept of multiplexing.
3. Understand the concept of MAC and datalink layer.
4. Describe the functions of network layer .
5. Explain the services of Transport and Application Layer.

### **UNIT-I:**

#### **Introduction to computer Networks:**

- What is computer network, Tools and motivation.
- Application of networks.
- point-to-point or switched networks.  
Circuit switched networks \ packet switched networks.  
Broad Cast Networks, Packet radio networks, Satellite Networks, LAN.
- Network protocols, OSI model.
- Examples of some networks, concept of delays, how to reduce delays.

#### **Data Transmission:**

- Transmission Terminology
- Analog & Digital data Transmission
- Transmission impairments.
- Transmission media and its characteristics.

### **UNIT-II:**

Data encoding and communication technique PCM, AM, FM and PM.

Asynchronous Transmission, synchronous Transmission, Error detection technique, Parity, CRC & FEC.

Interfacing RS. 232 and X.21 Multiplexing and communication Hardware.

FDM, TDM, STDM, Modems, Multiplexer, Demultiplexer, concentrators, Front end processors.

### **UNIT-III**

#### **MAC and Data Link Layer :**

- DLL fundamentals.
- Retransmission strategies.

- Contention based MAC protocols
  - Polling based MAC Protocols
- MAC Protocols High speed networks.

#### **UNIT-IV**

##### **Network Layer :**

- Introduction to layer.functionality
- Routing
- Congestics Control Algorithms
- IP
- Internetworking.

#### **UNIT-V**

##### **Transport Layer and application layer services:**

- Transport services and mechanism
- Transport control mechanism
- TCP/UDP
- RPC : (Remote Procedure Call)
- Applications: FTP, Telnet, E-mail, WWW, DNS.

##### **BOOKS:**

1. Computer Network A system approach, 4th ed.: Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann Publishers.
2. . Data Communications and networks:Forouzan, TMH.

##### **Reference Books:**

1. Computer Networks:Andrew Tanenbaum, PHI Publication,
2. Data & Computer Communication: William Stallings, PHI Publication.

## **CS-205: CORE 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:** Paradigm of programming languages, comparison of procedure oriented approaches and object oriented concepts, basic concept of OOPS, introduction to Java, basic features of Java, JVM concepts data types, variables, Java operators, expressions, various types of control statements, Arrays,lambada expression in java.

**Class & Objects** : Class fundamentals, creating object's, introducing methods, static methods, constructors, types of constructors, constructor overloading, this keyword, garbage collection, finalize method, enum , enum comparison with a class.

### **UNIT-II**

**Inheritance and polymorphism** : inheritance basics, access control, multilevel inheritance, -abstract class, polymorphism, final keyword.**Packages and interfaces** : Definition of package, seeing the CLASS PATH, package naming, interface. Generic class of collection frame work, annotation in java.

### **UNIT-III**

Multithreading, I/O and string handling, introduction to multithreading, main thread, lava thread model, thread class & runnable interface, thread properties,synchronization in java, interthread communication, I/O basics, FILE stream classes, byte stream classes *and* character stream classes, Input and output stream hierarchy reading and writing data from and to file, transient and volatile modifiers, stream tokenizer, serialization, print stream, random access files.

### **UNIT-IV**

Exceptions, types of exception, handling of exceptions using try, catch, catching multiple exceptions using finally clause, throwing exception. Applet programming, graphics & user interfaces and exception handling, applet class, applet architecture, handling events, HTML applet tag, passing parameter to applet

**UNIT-V Awt:** Awt class, Awt controls, layouts and layout manager, event handling by AWT components, menu bars and menus, Swings fundamentals, difference between AWT and Swing based GUI.

### **RECOMMENDED AND REFERENCE BOOKS :**

1. Programming with Java, E. Balaguruswamy.
2. Java Complete Reference, Herbert Schildt.
3. Web Enabled Commercial Application Development using Java 2.0, Ivan Bayross.

### **REFERENCE BOOKS :**

1. Core Java Vol-I Fundamentals, Core Java Vol-II Fundamentals, Gay Cornell.
2. Java In a Nutshell, David Flanagan (O'reilly Publication)

## CS-206L- JAVA PROGRAMMING

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)  $(a \ll 2) + (b \gg 2)$

ii)  $(a) \ll (0 \gg 0)$

iii)  $(a + b * 10) / 10$

iv)  $a \& b$

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

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

Exercise: 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
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**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 23451 will 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 string type. The methods are set\_length(), set\_width(), set\_colour(), and find\_area(). Create two objects 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\_Balanc 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 ArraylndcxOutOfBoundsException, 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: Write 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.

## CS-207L: 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, correlated queries, 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.

### 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.

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

**Function** : Definition, declaration, how to execute a oracle function. . ' ^

**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

# Semester – 3

## 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:

#### **Introduction to Compilers:**

Translators and Compilers, phases of a compiler, compiler writing tools, Lexical and syntactic structure of a language, multi-pass compilers, cross compiler. 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 DATA MINING AND WARE HOUSING**

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

1. Understand the basics of types of data, quality of data, suitable techniques required for pre processing and measures required to perform data analysis.
2. Demonstrate knowledge of Data Warehouse and its components.
3. Describe the need of classification; identify suitable technique(s) to perform classification, model building and evaluation.
4. Explain process of knowledge discovery in database (KDD). Design Data Mining model.
5. Identify the requirements and usage of association rule mining on categorical and continuous data.

**UNIT – 1:** What is Data Mining ?What Kinds of data can be Mined? Database Data, Data Warehouses, Transactional Data, Other kinds of data.Data Mining Functionalities.Major Issues of Data Mining.

What is Data Warehouse ? A Multidimensional Data Model. Data warehouse Architecture.Data Cube and OLAP operations, Data Warehouse Implementation.

**UNIT – II:** Data Preprocessing: An Overview,Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization,Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity.

**UNIT – III:** Market Basket Analysis: A Motivating Example , Frequent Itemsets, Closed Itemsets, and Association Rules, Frequent Pattern Mining, Apriori Algorithm: Finding Frequent Itemsets by Confined Candidate Generation, Generating Association Rules from Frequent Itemsets,

Mining Various Kinds of Association Rules: Mining Multilevel Association Rules, Mining Multidimensional Association Rules , Mining Quantitative Association Rules

**UNIT – IV:** Concept of Classification and Prediction, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Backpropagation,  $k$ -Nearest-Neighbor Classifiers, Genetic Algorithms, Rough Set Approach, Fuzzy Set Approaches. Classifier Accuracy Measure

**UNIT – V:** What is Cluster Analysis ?Categorization of Major Clustering Methods, Partitioning Methods: K-Means and k-Medoids, Hierarchical Methods: Agglomerative and Divisive Hierarchical Clustering, Density based methods: DBSCAN, Grid based Methods: STING, Model Based Methods, Outlier Analysis, Mining Multimedia database, Mining Text databases, Mining the WWW.

### **BOOKS:**

1. Data Mining : Concepts and Techniques, J. Han and M. Kamber, Morgan Kaufmann Publishers, Elrevis India (2001).
2. Principles of Data Mining : D. Hand, H. Mannia &P. Symth, MIT Press, 2001,
3. Recent Literatures from ACM SIGMOD, VLDB, IEEE Trans, Knowledge and Data Engg, Knowledge Discovering, ACM SIGKOD, IEE ICDM, SIAM, Data Mining, ICML

# **CS-303: JAVA PROGRAMMING ( ADVANCE)**

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

1. Learn the deployment process of Web application in web server.
2. Preparing configuration for the deployment process through the XML file for web server.
3. Development of web application using servlet programming.
4. Learn Session tracking management in web application.
5. Learn JSP tag uses in place of servlet programming.
6. Learn the Life cycle process of JSP technology and standard action tag of JSP in addition to JSP tag .

## **UNIT-I**

### **Reflection API, JavaBean & RMI**

Reflection package, introduction to bean, creating bean, types of beans, deploying beans.

overview of RMI applications, RMI architecture, RMI object hierarchy, creating stubs and skeleton.

## **UNIT-II**

### **Database Connectivity and XML**

Database connection, JDBC drivers, statements & types, record sets & various operators, electronic data transaction by XML-introduction, DTD, comparison between HTML & XML, difference between HTML & XML, CSS, XSL, XML schema.

## **UNIT-III**

### **Servlet (Server side Component):-**

Server-side component using servlet- introduction, Background, life-cycle of servlet, Web-server for Servlet Development, architecture, simple servlet programming using javax.servlet API, Handling HTTP Request & Response Reading Servlet Parameter, Database access through Servlet.Cookies & Session Tracking.

## **UNIT-IV**

### **JSP (Server side Scripting):-**

Server-side scripting of JSP- Introduction, Background, Life cycle of JSP, architecture, JSP programming using predefined tags (expression, Scriptlet, Declaration, Directive), use of standard action tags, communication between HTML & JSP, Database access using JSP,

## **UNIT-V**

### **JSTL(JSP Standard Tag Library):-**

Introduction to JSTL.What is JSTL, Creating Custom Tag in JSP, JSTL core tags (out tag, remove tag, set tag, if tag, choose when tag, forEach tag, URL, redirecting tags ), JSTL function tags(String manipulation function), JSTL SQL Tags, JSTLXML tags.

### **RECOMMENDED BOOKS :**

1. Java servlet programming (O' Reilly)
2. Java JSP Programming (O' Reilly)
3. Sams Teach Yourself XML in 21 days.

# **CS-304: MANAGEMENT INFORMATION SYSTEM & E-COMMERCE**

## **UNIT-I : Fundamentals of information systems concepts :**

Need for information, systems - what managerial and users need to know, system concepts-business as a system - information processing concepts - information systems concept, recognizing information systems.

### **Information systems for operations management and strategic advantage:**

An overview of information systems - information systems for business operations - information systems for management decision-making, competitive strategy concepts - strategic roles for information systems -strategic information systems and the managerial end-user.

## **UNIT-II : The systems development, analysis, design and implementation:**

The scientific method - the systems approach -understanding a problem and opportunity - developing a solution - implementing a solution - systems development process prototyping - end user development - managing end-user development - managing end-user computing -principles for managing PCs-off-self software - outsourcing - comparison of different methodologies - challenges in developing information systems - IS development in a global environment.

## **UNIT-III : Transaction processing information reporting and executive information system :**

Introduction - the data entry process - batch processing - real-time processing - file and database processing - document and report generation. Attributes of information quality - information presentation alteration information reporting systems - executive information systems.

### **Management decision making and decision support system:**

information and decision making - information and management: Information reporting vs decision support system - decision support system - models for decision support - software for decision support - using decision support system , developing decision support systems.

## **UNIT-IV :**

### **Business Information Systems :**

Marketing Information System -Manufacturing Information System - Human Resource Information system - Accounting Information System -Financial Information System.

## **UNIT V**

### **Electronic Commerce**

Traditional commerce and E-commerce – Role of Internet in E-commerce , Value Chains – Strategic Business And Industry Value Chains – Role of E-commerce. E-commerce software, security threats to e-commerce, protecting e-commerce systems. Payment systems for e-commerce.

### **Mobile Commerce**

Introduction – Infrastructure of M–Commerce – Types Of Mobile Commerce Services –Mobile Marketing & Advertisement, Applications of M–Commerce

### **BOOKS :**

1. Management Information System, James A 'o' Brien, Galgotia Publications.
- 1 Management Information System, Uma G. Gupta, Galgotia Publications.
- 2 . E.Brian Mennecke, J.Troy Strader, “Mobile Commerce: Technology, Theory and Applications”, Idea Group Inc., IRM press, 2003.
- 3 2. Ravi Kalakota, B.Andrew Whinston, “Frontiers of Electronic Commerce”, Pearson Education, 2003.

### **REFERENCES:**

1. Management Information Systems, Charles Parker and Thomas Case, McGraw Hill International.
2. Management Information Systems, W.S. Jawadekar, Tata McGraw Hill.

# **CS-305 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 Protocol Zigbee, 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 Autonomy and 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-infrastructure security Industries- IoT electronic equipments. Use of Big Data and Visualization in IoT Industry 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 Madiseti, "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>.

# **CS-306L OPEN SOURCE PROGRAMMING**

## **UNIT-I:**

### **Introduction to Open Source Programming and PHP**

Introduction to Apache, MySQL, PHP and open source , how XAMPP works ,Using HTML in PHP ,variables, operators, constants, control structure, arrays, functions, classes, handling files, form handling, form validation, linking forms together.

## **UNIT-II:**

### **Database Programming**

Overview of MySQL , using PHP with MySQL , MySQL database programming ,connecting , table creation , record insertion , updation , multiple database handling , Querying the database , using tables to display data, storing images in database.

## **UNIT-III:**

### **Mails, Session & Cookies**

E-mailing with PHP, sending an e-mail , getting confirmation ,user logins, profiles and personalization. Session tracking using PHP ,Cookies.

## **UNIT-IV: PYTHON**

Introduction to python, data types, numbers, variables and simple input output ,control statements, string, tuples, lists ,dictionary, set, frozen set, functions, lambda function, filter, map, reduce functions, files & directories, exception handling.

## **UNIT-V:**

Classes, \_\_init\_\_ method,self, Inheritance, Multiple Inheritance, Constructors in Inheritance, Importing module,Iterators and generators,decorators Databases and SQL ,Use the Create, Read, Update, and Delete operations to manage databases,

## **TEXT BOOKS :**

PHP Professional Projects, Ashish Wilfred Metta Gupta and Karticj Bhatnagar-Prentice Hall and India Pvt. Ltd., New Delhi, 2002.

## **REFERENCE BOOKS :**

1. Beginning PHP, Apache, Mysql Web Development Micheal K. Class, Rommnel Scurarnec,Wiley Dream Tech Publishing Incf, New Delhi 2004.
2. Core PHP Programming, Leon Alkinson and Zeev Suraski, Pearson Education, Delhi, 3rd Ed., 2004.
3. Teach Yourself Perl, Clinton Pierce, Techmedia, New Delhi, 2004.
4. Tom Christiansen and Nathan Torkington, Perl Cookbook, Shroff Pub., 1009.
5. Python Programming for the Absolute Beginner by Michael Dawson Premier Press

# **CS-307L WEB TECHNOLOGY LAB**

## **UNIT – I**

HTML- Basic HML, The document body, Text, Hyperlinks, Adding More Formatting, Lists, Using Color and Images, Tables, Frames, Forms, Cascading Style sheets – Introduction, Inline Styles, Embedded Style Sheets, Linking external sheets, Backgrounds, text flow and box model.

## **UNIT – II**

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 – III**

JavaScript: Objects – Math Object, String Object, Date Object, Boolean & Number Object, document and window Objects.

Events,How does it work?,Objects and Events,Creating an Event handler,Changing Event handlers,Managing JavaScript Events,Mouse Events,Keyboard Events,the onLoad and onUnload Events,Event Simulation,The Event object,Event capturing,Turning off Event capturing.

## **UNIT-IV**

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**

Document Object Model (DOM) and W3CDOM Levels,DOM and JavaScript,New DOM Concepts, Element Referencing, Hierarchy of nodes, , Document Type Definitions (DTDs),

## **TEXT BOOKS**

1. Internet & World Wide Web- H. M. Deitel, P.J. Deitel, A. B. Goldberg-Third Edition
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 )
3. HTML & XML An Introduction NIIT(PHI)
4. HTML for the WWW with XHTML & CSS by Wlizabeth Castro(Pearson)
5. Fundamentals of the Internet an the World Wide Web by Raymond Green Law and Ellen Hepp (TMH)
6. Internet and Web Technologies by Raj Kamal (TMH)
7. Internet and Web Basics by Ned Snell, Bob Temple, TM Clark (Pearson)
8. <http://nptel.iitm.ac.in/video.php?subjectId=106105084>

## **MINI PROJECT (100 MARKS)**

## **Semester – 4**

### **CS-401 Data Science and Machine Learning**

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

1. understand basics of Data science concepts.
2. Understanding about Machine Learning algorithm and their perspectives.
3. Able to learn about data visualization and Tableau
4. Ability to solve real problems by implementing machine learning
5. Design and implement supervised and unsupervised machine learning algorithms for real-world applications

#### **Unit 1**

**Data analysis:** Introduction, Terminology and concepts, AI, Machine Learning and DataScience, Extracting meaningful patterns, Building Representative Model, Combination of Statistics, ML and Computing, Learning Algorithms, Associated Fields

#### **Unit 2**

**Data Analytics Lifecycle: Overview** - Discovery - Data Preparation - Model Planning - Model Building - Communicate Results – Operationalize, linear model, properties of regression coefficients, Spurious regression concepts, significance of regression coefficients using t test and F test.

#### **Unit 3**

**Data visualization:** Concepts and uses of Business Intelligence, Explain Tableau, installation and loading data from excel. Working with Metadata, Filters in Tableau, Structuring data in Tableau, Creating Charts and Graphs.

#### **Unit 4**

**Introduction to Machine Learning:**

Types of Human Learning, What is Machine Learning, Types of Machine Learning, Application of Machine Learning, Issues in ML

**Preparing to model:**

Basic data type, exploring numerical and categorical data types, exploring relationship between variables, data pre-processing

**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.

#### **Unit-5**

**Supervised Learning-Regression:** Concept of regression, Simple linear regression, Ordinary least squares estimation, Correlations, Multiple linear regression.

**Unsupervised Learning:** Basics of unsupervised learning, association rules, clustering techniques

#### **TEXT BOOK**

1. Data Science Concept and Practice- VijayaKotu and BalaDeshpandey
2. V.K. Jain, Data Science and Analytics
3. Machine Learning by SaikatDutt, S.Chandramauli, Amit Kumar Das

#### **Recommended Study Material**

2. Dr M Gopal, Applied Machine learning, McGraw Hill Education Private Limited
- 3.E. Alpayidin, Introduction to Machine Learning, Prentice Hall of India (2005)
- 4.T. Hastie, RT Ibrashiran and J. Friedman, The Elements of Statistical Learning, Springer 2001

# **CS-402 CRYPTOGRAPHY AND NETWORK SECURITY( ELECTIVE –I)**

**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:**

1. 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.

## **CS-402 Soft Computing (Elective-I I)**

### **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 perceptron 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.

2.Siman 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

# **CS-403 CLOUD COMPUTING(ELECTIVE –I)**

**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 , characteristics 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.

# **CS403:INTERACTIVECOMPUTERGRAPHICS(ELECTIVE-II)**

## **UNIT-I**

**Computer graphics applications, graphics systems :**video display devices, faster scan systems, graphics Monitors and workstations, input devices, hard copy devices, graphical user interface and interactive input methods : user dialogue, input of graphical data, interactive picture-construction techniques.

## **UNIT-II**

**Output primitives:** Points and lines, line drawing, algorithms, frame, buffer, circle generation and ellipse generation algorithms, pixel addressing and object geometry, filled area primitives, character generation, initialising.

## **UNIT-III**

**Two dimensional geometric transformations:** basic transformations (translation, rotation, scaling), matrix representations and homogenous coordinates, composite transformations (translation, rotation, scaling, reflection, shear) transformation between coordinates 3.2 systems.

**Two-dimensional viewing:** viewing pipeline, viewing coordinates reference frame, window to view port coordinate transformation, point 2.3, clipping 2.5, line dipping polygon clipping.

## **UNIT-IV**

**Three dimensional geometric: and modelling transformation:** Translation, rotation, scaling, reflection, shear. Three-dimensional viewing: viewing coordinates, projection, projection transformation, clipping.

## **UNIT-V**

Visible-surface detection methods-: back face detection, depth buffer, a-buffer, scan LINE, depth-sorting, BSP-tree, area subdivision method.

Illumination models and surface rendering method :light sources, illumination models, displaying light intensities, halftone patterns and dithering techniques, polygon rendering methods.

## **BOOKS.:**

1. Hearn, D. & Baker, M.P., Computer Graphics, 2/ed. (PHI)

## **REFERENCE BOOKS:**

1. Foley, J.D, Van Dam, A.V. Feinor, S.K. Hughes, 3.F. Computer Graphics: Principles & Practice, 2/ ed, (Addison-Wesley).
2. Rogers, D.F., Mathematical Elements of Computer Graphics (Me Graw-Hill)
3. Newman, W. & Sprent, R.F., Principles of Interactive Computer Graphics.

## **Major Project –(250 marks)**