

**DEPARTMENT
OF
COMPUTER SCIENCE**

MCA SYLLABUS

2020-2021

BIR TIKENDRAJIT UNIVERSITY CANCHIPUR-795003

MCA First Year Syllabus

FIRST YEAR

MCA1	Course Title	Internal	External
MCA-101	Mathematical Foundation of Computer Science	25	75
MCA-102	Computer Programming and Problem Solving in C	25	75
MCA-103	Computer Organization & Architecture	25	75
MCA-104	Fundamentals of Web Technologies	25	75
MCA-105	Data Structures in C	25	75
MCA-106	Database Systems	25	75
MCA-107	Formal Language and Automata Theory	25	75

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Subject Code : MCA-101

Unit -I :Set Theory:-

Sets and Subsets, set operations and the laws of Set theory, counting and Venn diagrams, cardinality-countable and uncountable sets.

Unit -II :Relations and Functions :-

Cartesian products and relations. Computer representation of relations -diagraphs, Hasse diagrams, zero-one matrices. Partial orders, equivalence relation and partitions. Functions-injective, surjective, bijective.The Pigeon-hole principle, composition of functions and inverse functions.

Unit -III :Fundamentals of Logic :-

Basic connectives and Truth tables, Logic equivalence- The laws of logic, Logical implication- Rules of inference, Predicate Calculus; Predicate and Quantifiers. Definitions and Proofs of Theorems.

Unit -IV :Properties of integers:-

Mathematical Induction, Well ordering principle-Mathematical induction, Recursive definitions.

Unit -V :Algebraic Structures, Coding theory and Rings :-

Groups, Subgroups, Monoids, Submonoids, Normal subgroups, Homomorphisms, Isomorphism and Cyclic groups. Elements of coding theory, the Hamming metric, the parity check and generator matrices.

Unit -VI : Matrices and Boolean Algebra :-

Lattice and its properties, Axiomatic definition of Boolean Algebra as algebraic structure ; Duality ; Basic results; Boolean Algebra of truth values; Applications (switching circuits, decision tables).

Unit-VII

Matrices and system of linear equations, operation of matrices; Solution of system of linear equations using matrix method. Eigen values, eigen vectors, diagonalisation of matrices.

Text Book 1. Ralph P Grimaldi, “Discrete & Combinatorial Mathematics,” 5th Edition, Pearson

Education, 2004.

Reference Books

1. Alan Doerr, Kenneth Levasseur : “Applied Discrete Structures for Computer Science”, Galgotia Publications Pvt. Ltd.

Kenneth H Rosen, “Discrete Mathematics & its Applications,” 7th edition, McGraw-Hill, 2010

PROBLEM SOLVING USING C

Subject Code : MCA-102

Exam Marks: 75 Exam Hours: 03

Unit -I: Overview: -

Algorithms, Flow Charts, Variables, Data types, Constants, Declarations, Operators, Precedence, Associativity, Order of evaluation, Type conversion, Storage classes, Programming Examples

Unit -II :Input and output statements:-

scanf, getchar, gets, printf, putchar, puts; Control Statements – if, else-if, switch, Control Structures – while, for, do-while, break and continue, goto, Programming Examples

Unit -III: Arrays:-

Single dimension, Two-dimensional, Multi dimensional Arrays, Strings, Programming Examples

Unit -IV :Functions:-

Categories of functions, Pointers, Pointer arithmetic, Call by value, Pointer Expression, Pointer as function arguments, , recursion, Passing arrays to functions, passing strings to functions, Call by reference, Functions returning pointers, Pointers to functions, Programming Examples

Unit -V: Structures and Unions:-

Defining, declaring, initialization, accessing, comparing, operations on individual members; array of structures, structures within structures, structures and functions, pointers and structures, bit fields, Programming Examples

Unit -VI:Files:-

Defining, opening, closing, input and output operations, error handling, random access; Command line arguments;

Unit -VII:Dynamic Memory Allocation:-

Definition, malloc, calloc, realloc, free, dynamic arrays Preprocessor – definition, macro substitution, file inclusion, compiler control directives, Programming Examples

Text Books

1. Programming in ANSI C, Balaguruswamy, Tata McGraw-Hill, 6thEdn.
2. The C Programming Language, Brian W Kernighan, Dennis M Ritchie, PHI, 2ndEdn.

Reference Books

1. Programming with C, Byron Gottfried, Tata McGraw-Hill edition 2. Simplifying C, HarshalArolkar, Sonal Jain, Wiley Publications
3. Head First C, David Griffiths, & Dawn Griffiths, O'Riley
4. C Programming, Dr. Vishal M Lichade, Dreamtech press. 2ndEdn.

COMPUTER ORGANISATION & ARCHITECTURE Subject Code : MCA-103

Unit-I :Number System:-

Binary, Octal and Hexadecimal. Positive and negative numbers; Fixed point and floating point quantities.**Arithmetic operations:** Addition, subtraction etc.**Character Code:** ASCII, EBCDIC and Unicode. **Redundant coding for error detection and correction:** Concept of Hamming distance, parity codes, Hamming codes, block codes, Cyclic redundancy codes.

Unit-II :Boolean Algebra:-

Boolean variables and functions-canonical and standard forms, truth table, minimisation of boolean function.

Unit-III:Karnaugh map:-

Simplification of Boolean function using Karnaugh map – octet, quad, pair mappings; with two, three, and four variable functions; using don't care functions.

Unit-IV: Combinational logic circuits:-

AND, OR, NOT, NAND, NOR, X-OR gates and tri-state buffer; implementation of Boolean functions using logic gates; Multiplexers, decoders, encoders, simple arithmetic and logic circuits.

Unit-V: Sequential Circuits:-

Flip-flops, triggering of flip-flops, registers, shift registers and counters (asynchronous and synchronous).

Unit-VI :Semiconductor memory:-

RAM, ROM; magnetic core and surface memory- disk, drum, tape; Solid state disk, Flash memory; Access time and cost considerations; concepts of volatility, random access, serial access, direct access, online and backup storage.

Unit-VII : CPU Block Diagram:-

Simple functional block diagram of a CPU with its relevant units. Generations of digital computers.

Reference Books:

1. Mano, M.M.: “Digital Logic and Computer Design”, Pearson, 2004.
2. Rajaraman, V., Radhakrishnan: “ An Introduction to Digital Computer Design,” 4th edition, PHI(EEE).
3. Mano, M.M.: “Computer System Architecture,” 3rd edition, Pearson.
4. Hamacher, Vranesic, Zaky, “Computer Organization”, 5th Tata McGraw-Hill.
5. Albert Paul Malvino& Jerald Brown: “Digital Computer Electronics,” 3rd edition, McGraw- Hill.

FUNDAMENTALS OF WEB TECHNOLOGIES Subject Code : MCA-104

Unit - I :Fundamentals:-

Internet, WWW, Web browsers and Web servers, URLs, MIME, HTTP, Security, Cyber laws.

Web Foundations:Evolution of the Web, Peek into the History of the Web, Internet Applications, Networks, TCP/IP, Higher Level Protocols, Important Components of the Web, Web search Engines, Application Servers.

Unit -II :Introduction to XHTML:-

Basic Syntax, Standard structure, Elements, Attributes, Images, Hypertext Links, Lists, Tables, Forms, Frames, Iframes, Symbols

Unit - III : Cascading Style sheets:-

Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and <div> tags, Conflict resolution.

Unit -IV :The Basics of JavaScript:-

Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

Unit -V :JavaScript and HTML Documents:-

The JavaScript execution environment, The Document Object Model (DOM), Elements access in JavaScript, Events and Event handling, Handling events from body elements, handling Event from Text Box and password elements, the DOM2 event model, the navigator object, DOM tree traversal and modification.

Unit -VI :Dynamic Documents with JavaScript:-

Introduction, Positioning Elements, Moving Elements, Elements visibility, changing colors and fonts, dynamic content, stacking Elements, locating the mouse cursor, reacting to a mouse click, slow movement of elements, dragging and dropping Elements.

Unit -VII: Introduction to XM: -

Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

TEXT BOOK

REFERENCES

1. Robert. W. Sebesta, "Programming the World Wide Web", Pearson Education (VTU 4thEdn.).
2. M. Srinivasan: Web Technology Theory and Practice, Pearson Education, Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education.
3. Chris Bates: Web Programming Building Internet Applications, Wiley India. Internet Technology and Web Design, Instructional Software Research and Development (ISRDR) Group, Tata McGraw Hill.

DATA STRUCTURES IN C

PART A

Subject Code : MCA-105

UNIT - 1 :BASIC CONCEPTS:-

Pointers and Dynamic Memory Allocation, Algorithm Specification, Data Abstraction, Performance Analysis, Performance Measurement.

UNIT - 2 : ARRAYS and STRUCTURES:- 5 Hours

Arrays, Dynamically Allocated Arrays, Structures and Unions, Polynomials, Sparse Matrices, Representation of Multidimensional Arrays.

UNIT - 3 :STACKS AND QUEUES:- 6 Hours

Stacks, Stacks Using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues.

UNIT - 4 :LINKED LISTS:- 5 Hours

Singly Linked lists and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials, Additional List operations, Sparse Matrices, Doubly Linked Lists.

PART - B

UNIT - 5 : TREES – 1:-

Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Heaps, Binary Search Trees.

UNIT - 6 :HASHING:- 5 Hours

Introduction, Static hashing: Hashing Tables, hashing functions, Overflow handling, Dynamic Hashing: motivation for Dynamic hashing, Dynamic hashing using directories, Directoryless Dynamic hashing.

UNIT - 7 5 Hours MULTIWAY SEARCH TREES: M-way Search Trees, B-Trees, B+ Trees. Insertion deletion in B-Tree, B+ Trees.

UNIT - 8 :EFFICIENT BINARY SEARCH TREES:- 5 Hours

Optimal Binary Search Trees, AVL Trees, Red-Black Trees, Splay Trees.

Text Book:

1. Horowitz, Sahni, Anderson-Freed: Fundamentals of Data Structures in C, 2 Edition, University Press, 2007 (Chapters 1, 2.1 to 2.6, 3, 4, 5.1 to 5.3, 5.5 to 5.7, 8.1 to 8.3, 10, 11)

Reference Books:

1. Yedidyah, Augenstein, Tannenbaum: Data Structures Using C and C++, 2 Edition, Pearson Education, 2003.

DATABASE SYSTEMS

Subject Code : MCA-107

Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

UNIT – 2 Entity-Relationship Model:- 6 Hours

Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

UNIT – 3 Relational Model and Relational Algebra :- 7 Hours

Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

UNIT – 4 SQL – 1:-

SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries.

PART - B

Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Additional features of SQL; Database programming issues and techniques; Embedded SQL, Dynamic SQL; Database stored procedures.

UNIT – 6 Database Design – 1:-

Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form

UNIT – 7 Database Design -2: -

Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal Forms.

UNIT – 8 Transaction Management:-

The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Checkpointing; Recovering from a System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007.

(Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10)

2. Alexis Leon & Mathews Leon, Database Management Systems, Vikas Publishing House Pvt. Ltd. (Chapter 5,7,8,9,10,11,12,14,15,16,17,18,19,21,26,27,28,29,30,32)

Reference Books: 1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.

FORMAL LANGUAGES AND AUTOMATA THEORY

Subject Code : MCA-107

PART - A

UNIT – 1:Introduction to Finite Automata:-

Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata

UNIT – 2 :Finite Automata, Regular Expressions:-

An application of finite automata; Finite automata with Epsilon-transitions; Regular expressions; Finite Automata and Regular Expressions; Applications of Regular Expressions

UNIT – 3 :Regular Languages, Properties of Regular Languages:-

Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages; Equivalence and minimization of automata

UNIT – 4 :Context-Free Grammars And Languages :-

Context –free grammars; Parse trees; Applications; Ambiguity in grammars and Languages.

PART – B

UNIT – 5:Pushdown Automata:-

Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata

UNIT – 6 : Properties of Context-Free Languages:-

Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFLs

UNIT – 7 :Introduction To Turing Machine:-

Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers.

UNIT – 8 :Undecidability:-

A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem; Other undecidable problems.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata Theory, Languages and Computation, 3th Edition, Pearson Education, 2007. (Chapters: 1.1, 1.5, 2.2 to 2.5, 3.1 to 3.3, 4, 5, 6, 7, 8.1 to 8.4, 8.6, 9.1, 9.2, 9.4.1, 9.5)

Reference Books:

K.L.P. Mishra: Theory of Computer Science, Automata, Languages, and Computation, 3th Edition, PHI Learning, 2009.

Raymond Greenlaw, H.James Hoover: Fundamentals of the Theory of Computation, Principles and Practice, Elsevier, 1998.

John C Martin: Introduction to Languages and Automata Theory, 3th Edition, Tata McGraw-Hill, 2007.

Thomas A. Sudkamp: An Introduction to the Theory of Computer Science, Languages and Machines, 3th Edition, Pearson Education, 2006.

C.K.Nagpal: Formal Languages and Automata Theory, Oxford Higher Education.

FUNDAMENTALS OF WEB TECHNOLOGIES**Subject Code :MCA 104****Unit - I :Fundamentals:-**

Internet, WWW, Web browsers and Web servers, URLs, MIME, HTTP, Security, Cyber laws.

Web Foundations:Evolution of the Web, Peek into the History of the Web, Internet Applications, Networks, TCP/IP, Higher Level Protocols, Important Components of the Web, Web search