



RAYALASEEMA UNIVERSITY

Kurnool (A.P)-518007

(A State University Established by the Govt. of A.P)

Department of Computer Science

MCA Syllabus

Curriculum of MCA Programme as per the National Education Policy (NEP)-2020 with effect from the Academic Year 2022-23 in the University College and also in affiliated colleges under the jurisdiction of the Rayalaseema University

**COURSE STRUCTURE FOR MCA- I SEMESTER
Effective from Academic Year 2022-23 Admitted Batch**

S.No	Components of Study	Course Code	Title of the Course	Hrs/ week	Credits	Internals	External	Total
1	Core	CA11	C and Data Structures	4	4	20	80	100
2		CA12	Database Management Systems (Common to MCA and M.Sc(CS))	4	4	20	80	100
3		CA13	Operating Systems	4	4	20	80	100
4	Compulsory Foundation	CA14	Mathematical and Statistical Foundations (Common to MCA and M.Sc(CS))	4	4	20	80	100
5	Elective Foundation	CA15A	Computer Organization & Architecture (Common to MCA and M.Sc(CS))	4	4	20	80	100
		CA15B	Foundations of Data Science	4				
		CA15C	Formal Languages and Automata Theory	4				
6	Practical - I	CAP11	C and Data StructureLab	4	2	20	80	100
7	Practical - II	CAP12	Database Management SystemsLab	4	2	20	80	100
			Operating Systems Lab	4	2	20	80	100
8	Audit Course	CAA11	Business English and Soft Skills	2		100		
Total				38	26	140	560	800

COURSE STRUCTURE FOR MCA- II SEMESTER
Effective from Academic Year 2022-23 Admitted Batch

S.No	Components of Study	Course Code	Title of the Course	Hrs/ week	Credits	Internals	External	Total
1	Core	CA21	Object Oriented Programming through Java	4	4	20	80	100
2		CA22	Software Engineering	4	4	20	80	100
3		CA23	Web Technologies (Common to MCA and M.Sc(CS))	4	4	20	80	100
4	Internal Elective	CA24	<u>Design and Analysis of Algorithms</u> (Common to MCA and M.Sc(CS))	4	4	20	80	100
			Data Warehousing and Data Mining	4				
			Compiler Design	4				
5	Open Elective	CA25A	<u>Computational Thinking</u> (Common to MCA and M.Sc(CS))	4	4	20	80	100
		CA25B	E-Commerce	4				
		CA25C	Green IT	4				
6	Practical - I	CAP21	Object Oriented Programming using Java Lab	3	2	20	80	100
7	Practical - II	CAP22	Software Engineering Lab	4	2	20	80	100
	Practical - III	CAP23	Web Technologies Lab	4	2	20	80	10
8	Audit Course	CSA1	Human Values and Professional Ethics	2		50		
Total				41	26	160	640	800

COURSE STRUCTURE FOR MCA- III SEMESTER
Effective from Academic Year 2022-23 Admitted Batch

S.No	Components of Study	Course Code	Title of the Course	Hrs/ week	Credits	Internals	External	Total
1	Core	CA21	Artificial Intelligence	4	4	20	80	100
2		CA22	Big Data Analytics	4	4	20	80	100
3		CA23	Computer Networks	4	4	20	80	100
4	General Elective	CA24	Software Testing Methodologies	4	4	20	80	100
			Agile and Devops	4				
			Machine Learning	4				
5	Open Elective	CA25A	Internet of Things	4	4	20	80	100
		CA25B	Cloud Computing	4				
		CA25C	Cyber Security	4				
6	Practical - I	CAP21	Artificial IntelligenceLab	4	2	20	80	100
7	Practical - II	CAP22	Big Data AnalyticsLab	4	2	20	80	100
8	Practical - III	CAP23	Computer Networks lab	4	2	20	80	100
Total				41	26	180	720	900

**COURSE STRUCTURE FOR MCA)- IV SEMESTER
(W.e.f. 2022 – 2023 Batch)**

S.No	Components of Study	Course Code	Title of the Course	Hrs/week	Credits	Internal	External	Total
1	MOOCs Elective – I		Reinforcement Learning		4			100
			Deep Learning					
			Digital Marketing					
2	MOOCs Elective – II		Cyber Security		4			100
			Natural Language Processing					
			Data Analytics					
4	Project Work			8	8	50	150	200
	Seminar		Technical Seminar	4	2	50		50
	Total				16			400



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**COURSE STRUCTURE FOR MCA- I SEMESTER
Effective from Academic Year 2022-23 Admitted Batch**

S.No	Components of Study	Course Code	Title of the Course	Hrs/ week	Credits	Internals	External	Total
1	Core	CA11	C and Data Structures	4	4	20	80	100
2		CA12	Database Management Systems (Common to MCA and M.Sc(CS))	4	4	20	80	100
3		CA13	Operating Systems	4	4	20	80	100
4	Compulsory Foundation	CA14	Mathematical and Statistical Foundations (Common to MCA and M.Sc(CS))	4	4	20	80	100
5	Elective Foundation	CA15A	Computer Organization & Architecture (Common to MCA and M.Sc(CS))	4	4	20	80	100
		CA15B	Foundations of Data Science	4				
		CA15C	Formal Languages and Automata Theory	4				
6	Practical - I	CAP11	C and DS Lab	4	2	20	80	100
7	Practical - II	CAP12	DBMS and OS Lab	4	2	20	80	100
8	Audit Course	CAA11	Business English and Soft Skills	2		100		
Total				38	24	140	560	800

CA11: C and Data Structures

MCA-SEMESTER - I

L-T-P-C: 4-0-0-4

UNIT - I

Introduction to C: Constants and variables, Operators and Expressions, Managing Input and Output operators, Decision making-branching and looping, Arrays,

UNIT-II

Functions, Structures and Unions, Pointers, File handling in C.

UNIT – III

Data structure: Definition, types of data structures Recursion Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion. Preliminaries of algorithms, analysis and complexity .**Linear list** – singly linked list, Double linked list and circular linked list -implementation, insertion, deletion and searching operations on linear list.

UNIT - IV

Stacks-Operations, array and linked representations of stacks, stack applications, **Queues**-operations, array and linked representations. **Hash Table Representation:** hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing and rehashing, extendible hashing.

UNIT - V

Sorting Techniques: Insertion sort, selection sort, exchange-bubble sort, quick sort and merge sort Algorithms. **Trees:** Binary Trees, terminology, representation and traversals- pre, post & in order traversals. **Search Trees:** Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion

Text Books:

1. Programming in ANSI C, 5e, E. Balaguruswamy, TMH
2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
3. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

Reference Books:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.

CA12: Database Management Systems
(Common to MCA and M.Sc(CS))

MCA-SEMESTER - I

L-T-P-C: 4-0-0-4

Unit-I

Introduction to Databases: Introduction, An Example, Characteristics of the Database Approach, Actors on Scene, Workers behind the scene, Advantages of Using the DBMS Approach, A Brief History of Database Applications, When Not to Use a DBMS **[TB-3]**

Overview of Database Languages and Architectures: Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architecture for DBMSs, Classification of Database Management Systems **[TB-3]**

Unit-II

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model, Conceptual Design for Large Enterprises **[TB-1]**

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/Altering Tables and Views **[TB-1]**

Unit-III

Relational Algebra: Selection and Projection, Set Operations, Renaming, Joins, Division, More Examples of Algebra Queries **[TB-1]**

SQL: Queries, Constraints, Triggers: The Form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases **[TB-1]**

Unit-IV

Introduction to Normalization Using Functional and Multivalued Dependencies:

Informal Design Guidelines for Relation Schema, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form **[TB-3]**

Unit-V

Transaction Management and Concurrency Control: Transaction Concept, A Simple Transaction Model, Storage Structure, ACID Properties, Serializability, Transaction Isolation Levels, Concurrency Control, Lock-Based Protocols, Validation-Based Protocols **[TB-2]**

Note: For Practical Examples Please Go Through Reference 1

Text Books:

1. Data base Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, Mc Graw-Hill
2. Data base System Concepts, 6/e, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Mc Graw-Hill
3. Database Systems, 6/e Ramez Elmasri, Shamkant B. Navathe, Pearson

Reference Books:

1. Database Systems, 9/e, Carlos Coronel, Steven Morris, Peter Rob, Cengage
2. Introduction to Database Systems, 8/e, C J Date, Pearson

CA13: Operating Systems

MCA SEMESTER - I

L-T-P-C: 4-0-0-4

UNIT-I

Introduction to Operating System Concept: Types of Operating Systems, Operating Systems Concepts, Operating System Operations. Operating Systems Structures- Operating System Services, User Operating-System Interface, Introduction to System calls, Types of System Calls.

UNIT-II

Process Management: Process concept, Process State Diagram, Process control block, Process Scheduling, Inter process Communication, Threads- Threading Issues, Scheduling- Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

UNIT-III

Process Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, **Principles of deadlock:** System Model, Deadlock characterization, Deadlock handling, Deadlock Prevention, Detection and Avoidance, Recovery Starvation, Critical Regions form Deadlock

UNIT-IV

Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation Virtual Memory Management- Demand Paging, Page- Replacement Algorithms, Thrashing. **File-System Interface:** File Concept, Access Methods, Directory structure, File-System mounting, Files Sharing, Protection. File-System implementation- File-System Structure, Allocation Methods, Free-Space Management, Disk Structure, Disk Scheduling

UNIT-V

Case Studies: Linux System: Design Principles, kernel Modules, Process Management, File Systems, Input and Output, Interprocess Communication, Network Structure, Security. **Windows7:** Design Principles, System Components, Terminal Services and Fast User, File System, Networking, Programmer Interface.

Text Books:

1. Operating system concepts, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, John Wiley & Sons, Inc., Edition 9, 2011
2. Introduction to UNIX and Shell Programming, M. G. Venkateshmurthy, Pearson, 2005
3. UNIX & Shell Programming by B.M. Harwani, OXFORD University Press, 2013

Reference Books:

1. Advanced Programming in the UNIX Environment by W. Richard Stevens, Stephen Rago, Wesley Professional, 2013
2. UNIX Network Programming by W. Richard Stevens, 1990
3. Operating systems, William Stallings, PHI/Pearson, 6/E, 2009
4. Operating systems, Dietal, Dietal, Pearson, 3/e, 2007
5. Operating systems, Dhamdhare, TMH, 2/e, 2009

CA14: Mathematical and Statistical Foundations

(Common to MCA and M.Sc(CS))

MCA-SEMESTER - I

L-T-P-C: 4-0-0-0

UNIT I

Basic Probability and Random Variables: Sample Spaces and Events, Basic set theory, Definition of Probability, Axioms of Probability, Theorems on Probability: Addition theorem, Multiplication theorem, Conditional Probability, Bayes Theorem (Simple Problems). Random Variables: Introduction, Types of Random Variables, Discrete Random Variables, Continuous Random Variables, Probability Distributions function, Probability Density Function, Joint Distribution Function, Joint Density Function, Conditional Distribution

UNIT II

Sampling and Estimation Theory: Population and Sample, Statistical Inference Sampling With and Without Replacement Random Samples, statistical inference: Unbiased Estimates and Efficient Estimates, Point Estimation and Interval Estimation. Properties of Estimators Confidence Interval Estimates of Population Parameters, Maximum Likelihood Estimates and its properties (Statements only)

UNIT III

Tests of Hypothesis and Significance: Statistical Hypotheses. Null Hypotheses Tests of Hypotheses and Significance Type I and Type II Errors Level of Significance Tests, One-Tailed and Two-Tailed Tests

Procedure of Testing Hypothesis, Test of Statistical Hypotheses, t-test, F test, Z-test. Factor Analysis ANOVA (oneway)

Chi-Square Test for Goodness of Fit Contingency Tables Yates' Correction

UNIT IV:

Algebraic Structures and Number Theory: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

UNIT V:

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

Text Books:

1. Foundation Mathematics for Computer Science, 1st Edition, John Vince, Springer,2015
2. Probability & Statistics, 3rd Edition, Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers, 2018
3. Probability and Statistics with Reliability,2nd Edition, K. Trivedi, Wiley, 2011
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, H. Rosen, Tata McGraw Hill, 2003

Reference Books:

1. Probability and Computing: Randomized Algorithms and Probabilistic Analysis,1st Edition, M. Mitzenmacher and E. Upfal,2005
2. Applied Combinatorics,6th Edition, Alan Tucker, Wiley,2012

CA15A: COMPUTER ORGANIZATION & ARCHITECTURE

(Common to MCA and M.Sc(CS))

MCA SEMESTER - I

L-T-P-C: 4-0-0-4

UNIT I

Basic Structure of Computers: Computer Types, Functional units, Basic Operational concepts, Bus structures, Software, Performance, multiprocessor and multi computers, Historical perspective.

UNIT II

Machine Instructions and Programs: Numbers, Arithmetic Operations, and Characters, Memory locations and addresses, Memory operations, Instructions and Instruction sequencing, Addressing Modes, Assembly Languages, stacks and Queues, Basic Input/output Operations, role of Stacks and Queues Additional Instructions

UNIT III

Input/ Output Organization: Accessing I/O Devices, Interrupts, Processor examples, Direct Memory Access, Buses, Interface Circuits, and Standard I/O Interfaces

UNIT IV

The Memory Systems: Some Basic concepts, Semi-Conductor RAM memories, Memory System Consideration, Read-Only Memories, Speed, Size, and cost, Cache Memories, Performance considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNIT V

Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets. Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of General Purpose multiprocessors, Interconnection Networks.

Text Books:

1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization , John P. Hayes ,3rd Edition, McGraw Hill

Reference Books:

1. Computer Organization and Architecture, William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization, Andrew S. Tanenbaum, 4th Edition PHI/Pearson Fundamentals or Computer Organization and Design, SivaramaDandamudi Springer Int. Edition.



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4	Internal Elective	CA24	<u>Design and Analysis of Algorithms</u> (Common to MCA and M.Sc(CS))	4	4	20	80	100
			Data Warehousing and Data Mining	4				
			Compiler Design	4				
5	Open Elective	CA25A	<u>Computational Thinking</u> (Common to MCA and M.Sc(CS))	4	4	20	80	100
		CA25B	E-Commerce	4				
		CA25C	Green IT	4				
6	Practical - I	CAP21	Object Oriented Programming using Java Lab	3	2	20	80	100
7	Practical - II	CAP22	Software Engineering Lab	4	2	20	80	100
	Practical - III	CAP23	Web Technologies Lab	4	2	20	80	10
8	Audit Course	CSA1	Human Values and Professional Ethics	2		50		
Total				41	26	160	640	800

Paper-I: Object Oriented Programming using JAVA

MCA-SEMESTER - II

L-T-P-C: 4-0-0-3

UNIT-I:

Object oriented thinking and Java Basics: Need for oop paradigm, summary of oop concepts, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, using final with variables, garbage collection, overloading methods and constructors, recursion, nested and inner classes, exploring string class.

UNIT-II:

Inheritance: Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance and methods, polymorphism- method overriding, abstract classes, the Object class. Packages: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT-III:

Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exception Handling: Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. String handling, Exploring java.util

UNIT-IV:

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. Handling menus, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag. Swing: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swingJApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

UNIT-V:

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Multithreading: Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter-thread communication, thread groups.

TEXT BOOKS:

1. Java the complete reference, Herbert schildt, 7th edition, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson edition.

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, T. Budd, 3rd edition, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. JohnsonThomson.
5. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary.
6. Cornell, 8th Edition, Pearson Education.
7. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, 8th Edition, Pearson Education.
8. Object Oriented Programming with Java, R. Buyya, S. T. Selvi, X. Chu, TMH.
9. Java and Object Orientation, an introduction, John Hunt, 2nd edition, Springer.
10. Maurach's Beginning Java2 JDK 5, SPD.
11. Programming and Problem Solving with Java, JM Slack, B S Publication

Paper-II: SOFTWARE ENGINEERING

MCA-SEMESTER - II

L-T-P-C: 4-0-0-3

Unit – I: Basic concepts in software engineering and software project management

Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, Organization and team structure, risk management, configuration management.

Unit – II: Requirements analysis and specification

The nature of software, The Unique nature of Webapps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE 830 guidelines, representing complex requirements using decision tables and decision trees, overview of formal system development techniques. axiomatic specification, algebraic specification.

Unit – III : Software Design

Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function oriented design. Overview of SA/SD methodology, structured analysis, Data flow diagram, Extending DFD technique to real life systems, Basic Object oriented concepts, UML Diagrams, Structured design, Detailed design, Design review, Characteristics of a good user interface, User Guidance and Online Help, Mode-based Vs Mode-less Interface, Types of user interfaces, Component-based GUI development, User interface design methodology: GUI design methodology.

Unit – IV : Coding and Testing

Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.

Unit – V: Software quality, reliability, and other issues

Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. Basic issues in any reuse program, Reuse approach, Reuse at organization level.

Text Book:

1. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018.
2. Pressman R, "Software Engineering- Practioner Approach", McGraw Hill.

Reference Books:

1. Somerville, "Software Engineering", Pearson 2.
2. Richard Fairley, "Software Engineering Concepts", Tata McGraw Hill.
3. Jalote Pankaj, "An integrated approach to Software Engineering", Narosa

Paper-III: WEB TECHNOLOGIES

(Common to MCA and M.Sc(CS))

MCA-SEMESTER - II

L-T-P-C: 4-0-0-3

UNIT-I:

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT-II:

HTML Common Tags: List, Tables, images, forms, Frames; Cascading Style sheets; XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

UNIT-III:

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

UNIT-IV:

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

UNIT-V:

Client-side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

TEXT BOOKS:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw Hill

REFERENCE BOOKS:

1. Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Java Script, D. Flanagan
4. Beginning Web Programming-Jon Duckett WROX.

Internal Elective-I
Paper-IV-IE-1: DESIGN AND ANALYSIS OF ALGORITHMS

(Common to MCA and M.Sc(CS))

MCA-SEMESTER - II

L-T-P-C: 4-0-0-0

UNIT I

Introduction: Algorithm, Algorithm specification, Performance analysis. Divide and Conquer: General method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Selection, Strassen's matrix multiplication.

UNIT II

Greedy Method: General method, Knapsack problem, Job Scheduling with Deadlines, Minimum cost Spanning Trees, Optimal storage on tapes, Single-source shortest paths. Dynamic programming: General Method, Multistage graphs, All-pairs shortest paths, Optimal binary search trees, 0/1 knapsack, the traveling salesperson problem.

UNIT III

Basic Traversal and Search Techniques: Techniques for binary trees, Techniques for Graphs, Connected components and Spanning trees, Bi-connected components and DFS Back tracking: General Method, 8 – queens problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles, Knapsack Problem.

UNIT IV

Branch and Bound: The method, Travelling salesperson, 0/1 Knapsack problem, Efficiency considerations. Lower Bound Theory: Comparison trees, Lower bounds through reductions – Multiplying triangular matrices, inverting a lower triangular matrix, computing the transitive closure.

UNIT V

NP – Hard and NP – Complete Problems: NP Hardness, NP Completeness, Consequences of being in P, Cook's Theorem, Reduction Source Problems, Reductions: Reductions for some known problems

Text Books

1. Ellis Horowitz, SartajSahni and Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, 2012, University Press.
2. ParagHimanshu Dave and HimanshuBhalchandra Dave, "Design and Analysis of Algorithms", Second Edition, Pearson Education.

Reference Books

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
4. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.

Internal Elective-II

Paper-IV-IE-2: DATA WAREHOUSING AND DATA MINING

MCA-SEMESTER - II

L-T-P-C: 4-0-0-0

UNIT I:

Data Warehousing and Online Analytical Processing: Data Warehouse: Basic concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Introduction: Why and What is data mining, What kinds of data need to be mined and patterns can be mined, Which technologies are used, Which kinds of applications are targeted.

UNIT II:

Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT III:

Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction

UNIT IV:

Association Analysis: Problem Definition, Frequent Item set Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Compact Representation of frequent item sets, FP-Growth Algorithm.

UNIT V:

Cluster Analysis: Overview, Basics and Importance of Cluster Analysis, Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bi-secting K Means

Text Book:

1. Data Mining Concepts and Techniques—Jiawei Han, Micheline Kamber and Jian Pei, Morgan Kaufman Publications 3rd edition.

Reference Books:

1. Introduction to Data Mining –Pang-Ning Tan, Michael Steinbach, Vipin Kumar
2. Introduction to Data Mining, Adriaan, Addison Wesley Publication
3. Data Mining Techniques, A.K. Pujari, University Press

Internal Elective-III
Paper-IV-IE-3: COMPILER DESIGN

M.Sc(CS)-SEMESTER - II
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L-T-P-C: 4-0-

Unit- I: Introduction: Language processors, Phases of a compiler, Pass and phase, Bootstrapping, Compiler construction tools, Applications of compiler technology.

Lexical Analysis: Role and Responsibility, Input buffering, Specification of tokens, Recognition of tokens, LEX tool, Design of a Lexical Analyzer generator

Unit – II: Syntax Analysis: Role of the parser, Context Free Grammars- Definition, Derivations, Parse trees, Ambiguity, Eliminating ambiguity, Left recursion, Left factoring.

TOP Down Parsing: Recursive descent parsing, Non-recursive predictive parsing, LL(1) grammars, Error recovery in predictive parsing.

Bottom Up Parsing: Handle pruning, Shift-Reduce parsing, Conflicts during shifts-reduce parsing, SLR Parsing, Canonical LR(1) parsers, LALR parsers, Using ambiguous grammars, YACC tool.

Unit – III: Syntax Directed Translation: Syntax Directed Definitions, Evaluation orders for SDD's, Application of SDT, SDT schemes, Implementing L-attribute SDD's.

Intermediate Code Generation: Need for intermediate code, Types of intermediate code, Three address code, Quadruples, Triples, Type expressions, Type equivalence, Type checking, Translation of expressions, control flow statements, switch statement, procedures, backpatching

Unit – IV: Run Time Storage Organization: Storage Organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack, Introduction to Garbage Collection

Machine-Independent Optimizations: Basic Blocks and Flow Graphs, Optimization of Basic Blocks, The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

Unit – V: Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

Text Books:

1. Compilers Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Pearson.
2. Compiler Design, K. Muneeswaran., Oxford University Press, 2012

Reference Books:

1. Compiler Construction, K.V.N Sunitha, Pearson, 2013
2. Engineering A Compiler, Second Edition, Keith D. Cooper & Linda Torczon., MK (Morgan Kaufmann) (ELSEVIER)
3. Compilers Principles and Practice, Parag H. Dave, Himanshu B. Dave., PEARSON
4. Compiler Design, Sandeep Saxena, Rajkumar Singh Rathore., S.Chand publication
5. Compiler Design, Santanu Chattopadhyay., PHI
6. Principles of Compiler Design, Nadhni Prasad, Elsevier

Open Elective

Paper-V-OE-1: Computational Thinking (Open Elective)

Common to MCA and M.Sc(CS))

MCA-SEMESTER - II

L-T-P-C: 4-0-0-0

Unit-I

Variables, Initialization, Iterators, Filtering, Datatypes, Flowcharts, Sanity of data, Iteration, Filtering, Selection, Pseudocode, Finding max and min, AND operator

Multiple iterations (non-nested), Three prizes problem, Procedures, Parameters, Side effects, OR operator, Nested iterations, Birthday paradox, Binning

Unit-II

List, Insertion sort, Table, Dictionary, Graph, Matrix, Adjacency matrix, Edge labelled graph

Unit-III

Backtracking, Tree, Depth First Search (DFS), Recursion, Object oriented programming, Class, Object, Encapsulation, Abstraction, Information hiding, Access specifiers

Unit-IV

Message passing, Remote Procedure Call (RPC), Cache memory, Parallelism, Concurrency, Polling, Preemption, Multithreading, Producer Consumer, Atomicity, Consistency, Race condition, Deadlock, Broadcasting

Unit-V

Top-down approach, Bottom-up approach, Decision tree, Numerical prediction, Behaviour analysis, Classification

Reference Books:

1. Computational Thinking: A Primer for Programmers and Data Scientists, G Venkatesh Madhavan Mukund
2. COMPUTATIONAL THINKING, A beginner's guide to problem solving and programming, Karl Beecher

Open Elective

Paper-V-OE-2: E – COMMERCE

MCA-SEMESTER - II

L-T-P-C: 4-0-0-0

UNIT - I

Electronic Commerce:-Frame work, Anatomy of E-Commerce applications, E-Commerce Consumer Applications, E-Commerce Organization Applications, Consumer Oriented Electronic Commerce: - Consumer Oriented Applications, Mercantile Process models.

UNIT - II

Electronic Payment Systems: - Types of Electronic Payment System, Digital Token-Based, Smart Cards, Credit Cards, Risks and Electronic Payment Systems.

UNIT - III

Inter Organizational Commerce and EDI:- Electronic Data Interchange, EDI in Application Business, EDI: Legal, Security and Privacy Issues, EDI and Electronic Commerce. EDI Implementation, MIME and Value Added Networks:- Standardization and EDI, EDI Software Implementation, EDI Envelope for Message Transport, Value added networks, Internet Based EDI.

UNIT - IV

Corporate Digital Library – Dimensions of Internal EC Systems, Making a Business Case for a Document Library, Types of Digital Document, Issues behind Document Infrastructure, Corporate Data Warehouses. Advertising and Marketing - Information Based Marketing, Advertising on Internet, On-line Marketing Process, Market Research.

UNIT - V

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering. Multimedia - Key Multimedia Concepts, Digital Video and Electronic Commerce, Desktop Video Processing's, Desktop Video Conferencing.

Text Book:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson, 1996.

References:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal – Galgotia.

Open Elective

Paper-V-OE-3: Green IT

MCA-SEMESTER - II

L-T-P-C: 4-0-0-0

UNIT-I

Trends and reasons to be green - Overview and Issues

Current initiatives and standards - Global initiatives – North America, Australia, Europe and Asia Consumption Issues – Minimizing issues – Minimizing power usage – Monitoring Power use – Reducing power usage – Low power Computers – Components

Data center design

Unit: II

Changing the way we work – Rethinking old behaviors – Steps – Tele workers and Outsourcing. Going paperless – paper problems – paper and your office - Going paper less - Intranets – Electronic data interchange.

Recycling – Problems – Means of disposals - Life Cycle - Recycling companies – Hard drive recycle – CDs and DVD.

Unit: III

Hardware considerations - Certification programs – Energy star – Blade Servers – Hardware Considerations – Remote Desktop.

Case Studies – Technology Business - Rack space – Other Organizations.

Unit-IV

The Greening Process – Data Center design and Redesign - Virtualization - Server virtualization - Solutions – Implementations.

Storage Virtualization – Types – Solutions – Savings

Greening your Information System - Initial improvement calculations – Change business processors – Improve Technology Infrastructures.

Staying Green – Organizational checkups – Equipment Checkups – Certifications.

TEXT BOOK

Green IT by J Velte, Anthony T.Velte, Robert Elsenpeter, McGraw-Hill

REFERENCES BOOK

Green IT Strategies and Applications Using Environmental Intelligence (2011) - CRC Press
Taylor and Fransis Group – Bhuvan Unhelkar.