



RAYALASEEMA UNIVERSITY

Kurnool (A.P)-518007

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

Department of Computer Science

M.Sc (Computer Science) Syllabus

Curriculum of M.Sc.(Computer Science) programmes 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 M.Sc(CS)- 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	CS11	Software Engineering	4	4	20	80	100
2		CS12	Database Management Systems (Common to MCA and M.Sc(CS))	4	4	20	80	100
3		CS13	Data Science with Python Programming	4	4	20	80	100
4	Compulsory Foundation	CS14	Mathematical & Statistical Foundations (Common to MCA and M.Sc(CS))	4	4	20	80	100
5	Elective Foundation	CS15A	Computer Organization & Architecture (Common to MCA and M.Sc(CS))	4	4	20	80	100
		CS15B	Object Oriented Programming(Java)	4				
		CS15C	Formal Languages and Automata Theory	4				
6	Practical - I	CSP11	DBMS and Software Engineering Lab	4	2	20	80	100
7	Practical - II	CSP12	Data Science with Python Programming Lab	4	2	20	80	100
8	Audit Course	CSA11	Business English and Soft Skills	2		100		
Total				38	24	140	560	700

COURSE STRUCTURE FOR M.Sc(CS)- 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	CS21	Operating Systems	4	4	20	80	100
2		CS22	Computer Networks	4	4	20	80	100
3		CS23	Web Technologies(Common to M.Sc(CS) and MCA)	4	4	20	80	100
4	Internal Elective	CS24A	<u>Design and Analysis of Algorithms</u> (Common to M.Sc(CS) and MCA)	4	4	20	80	100
		CS24B	Object Oriented Analysis and Design	4				
		CS24C	Compiler Design	4				
5	Open Elective	CS25A	<u>Computational Thinking</u> (Common to M.Sc(CS) and MCA)	4	4	20	80	100
		CS25B	E-Commerce	4				
		CS25C	Green IT	4				
6	Practical - I	CSP21	Operating Systems and Computer Networks Lab	4	2	20	80	100
7	Practical - II	CSP22	Web Technologies Lab	4	2	20	80	100
8		CSCV2	Comprehensive Viva		1		50	50
9	Audit Course	CSA21	Human Values and Professional Ethics	2		100		
Total				38	25	100	560	650

COURSE STRUCTURE FOR M.Sc(CS)- III SEMESTER
Effective from Academic Year 2022-23 Admitted Batch

S.No	Components of Study	Course Code	Title of the Course	Hrs/week	Credits	Internal	External	Total
1	Core	CS31	Big Data Analytics	4	4	20	80	100
2		CS32	Artificial Intelligence	4	4	20	80	100
3		CS33	Cryptography and Network Security					
4	General Elective	CS34A	Software Testing Methodologies	4	4	20	80	100
		CS34B	Agile and Devops	4	4	20	80	100
		CS34C	Machine Learning	4	4	20	80	100
5	Open Elective	CS35A	Internet of Things	4	4	20	80	100
		CS35B	Cloud Computing	4	4	20	80	100
		CS35C	Block Chain Technology	4	4	20	80	100
6	Practical - I	CSP11	Big Data Analytics Lab	4	2	20	80	100
7	Practical - II	CSP12	Artificial Intelligence	4	2	20	80	100
	Total				24	140	560	700

COURSE STRUCTURE FOR M.Sc(CS)- IV SEMESTER
Effective from Academic Year 2022-23 Admitted 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
	Total				16			400



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COURSE STRUCTURE FOR M.Sc(CS)- 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	CS11	Software Engineering	4	4	20	80	100
2		CS12	Database Management Systems (Common to MCA and M.Sc(CS))	4	4	20	80	100
3		CS13	Data Science with Python Programming	4	4	20	80	100
4	Compulsory Foundation	CS14	Mathematical & Statistical Foundations (Common to MCA and M.Sc(CS))	4	4	20	80	100
5	Elective Foundation	CS15A	Computer Organization & Architecture (Common to MCA and M.Sc(CS))	4	4	20	80	100
		CS15B	Object Oriented Programming(Java)	4				
		CS15C	Formal Languages and Automata Theory	4				
6	Practical - I	CSP11	DBMS and Software Engineering Lab	4	2	20	80	100
7	Practical - II	CSP12	Data Science with Python Programming Lab	4	2	20	80	100
8	Audit Course	CSA11	Business English and Soft Skills	2				
Total				38	24	140	560	700

CS11: SOFTWARE ENGINEERING

M.Sc(CS)-SEMESTER - I

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

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

CS12: Database Management Systems

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

M.Sc(CS)-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

CS13: Data Science with Python Programming

M.Sc(CS)-SEMESTER - I

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

Unit-I Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements. Strings: Creating strings and basic operations on strings, string testing methods. Lists, Dictionaries, Tuples.

Unit-II Functions: Defining a function, Calling a function, returning multiple values from a function, functions are first class objects, formal and actual arguments, positional arguments, recursive functions. Exceptions: Errors in a Python program, exceptions, exception handling, types of exceptions, the except block, the assert statement, user-defined exceptions.

Unit-III Classes and Objects, Class method and self argument, The __Init__ Method, Class Variables and Object Variables, The __Del__ Method, Public and Private Data Members, Private Methods

Inheritance and polymorphism: Inheriting Classes in Python, Polymorphism and Method Overriding, Types of Inheritance, Abstract Classes and Interfaces and Meta class.

Unit-IV Introduction to NumPy, Pandas, Matplotlib. Exploratory Data Analysis (EDA), Data Science life cycle, Descriptive Statistics, Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA. Data Visualization: Scatter plot, bar chart, histogram, boxplot, heat maps, etc.

Unit-V Introduction to Pattern Recognition and Machine Learning: Patterns, features, pattern representation, the curse of dimensionality, dimensionality reduction. Classification-linear and non-linear. Bayesian, Perceptron, Nearest neighbor classifier, Logistic regression, Naïve-Bayes, decision trees and random forests; boosting and bagging. Clustering-partitional and hierarchical; k-means clustering.

Textbooks:

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
2. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline. O'Reilly, 2013.
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007. **References:**
 1. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
 2. Francois Chollet, Deep Learning with Python, 1/e, Manning Publications Company, 2017
 3. EMC2: Data Science and Big Data Analytics, EMC Education Services, EMC 2 , Wiley Publication, 2015.
 4. V. Susheela Devi and M. Narasimha Murty. Pattern Recognition – An Introduction. Universities Press (Indian Edition; there is an expensive Springer version of the same)
 5. Goodfellow and YoshuaBengio and Aaron Courville. Deep Learning. MIT Press. Book available online at <https://www.deeplearningbook.org/>.
 6. J. Leskovec, A. Rajaraman, J.D. Ullman. Mining of Massive Datasets. Cambridge University Press. (Indian Edition; Online pdf is available for download)

CA14: Mathematical and Statistical Foundations

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

M.Sc(CS)-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

CA15B: COMPUTER ORGANIZATION & ARCHITECTURE

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

M.Sc(CS)- 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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7	Practical - II	CSP22	Web Technologies Lab	4	2	20	80	100
8		CSCV2	Comprehensive Viva		1		50	50
9	Audit Course	CSA21	Human Values and Professional Ethics	2		100		
Total				38	25	100	500	650

Paper-1: OPERATING SYSTEMS

M.Sc(CS) SEMESTER - II

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

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, Interprocess 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.

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, Dhamdhere, TMH, 2/e, 2009

Paper-II: COMPUTER NETWORKS

M.Sc(CS)-SEMESTER - II

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

Unit – 1: Computer Networks and the Internet

What is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in PacketSwitched Networks, Protocol Layers and their Service Models, Networks under attack, History of Computer Networking and the Internet

Unit – 2: Application Layer

Principles of Network Applications, The web and HTTP, File transfer: FTP, Electronic mail in theinternet, DNS-The Internet’s Directory Service, Peer-to-Peer Applications

Unit – 3:Transport Layer

Introduction and Transport-Layer Services, Multiplexing and De-multiplexing, ConnectionlessTransport: UDP, Principles of Reliable Data transfer, Connection-Oriented Transport: TCP, Principlesof Congestion Control, TCP Congestion Control

Unit – 4: The Network Layer

Introduction, Virtual Circuit and Datagram Networks, The Internet Protocol(IP): Forwarding andAddressing in the Internet, Routing Algorithms, Routing in the Internet, Broadcast and MulticastRouting

Unit – 5:The Layer: Links, Access Networks, and LANs

Introduction to the Link Layer, Error-Detection and Correction Techniques, Multiple Access Linksand Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, DataCenter Networking, Retrospective: A Day in the Life of a Web Page Request

Text Books:

1. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach”, 6th edition, Pearson, 2019.

References:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
3. Youlu Zheng, Shakil Akthar, “Networks for Computer Scientists and Engineers”, Oxford Publishers, 2016.

Paper-III: WEB TECHNOLOGIES (Common to M.Sc(CS) and MCA)
M.Sc(CS)-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 M.Sc(CS) and MCA)

M.Sc(CS)-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, Sartaj Sahni and Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, 2012, University Press.
2. Parag Himanshu Dave and Himanshu Bhulchandra 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

M.Sc(CS)-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—JiaweiHan, 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 MiningTechniques,A.K.Pujari,University Press

Internal Elective-III

Paper-IV-IE-3: COMPILER DESIGN

M.Sc(CS)-SEMESTER - II

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

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-I

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

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

M.Sc(CS)-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-II

Paper-V-OE-2: E – COMMERCE

M.Sc(CS)--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-III

Paper-V-OE-3: Green IT

M.Sc(CS)-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.