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
COURSE STRUCTURE FOR M.Sc(CS)- I SEMESTER
(W.e.f. 2021 – 2022 Batch)

Code	Name of the Subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Lab	External	Internal		
M.Sc 1T1	Mathematical Foundations of Computer Science	4	--	80	20	100	4
M.Sc 1T2	Database Management Systems	3	--	80	20	100	3
M.Sc 1T3	Python Programming	3	--	80	20	100	3
M.Sc 1T4	Design and Analysis of Algorithms	4	--	80	20	100	4
M.Sc 1T5	Computer Organization	3	--	80	20	100	3
M.Sc 2P1	Database Management Systems Lab	--	3	80	20	100	1.5
M.Sc 2P2	DAA with Python Lab	--	3	80	20	100	1.5
Total						700	20

COURSE STRUCTURE FOR M.Sc(CS)- II SEMESTER
(W.e.f. 2021 – 2022 Batch)

Code	Name of the Subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Lab	External	Internal		
M.Sc2T1	Operating Systems	3	--	80	20	100	3
M.Sc 2T2	Web Technologies	3	--	80	20	100	3
M.Sc 2T3	Software Engineering	4	--	80	20	100	4
M.Sc 2T4	Computer Networks	3	--	80	20	100	3
M.Sc 2T5	Compiler Design	4	--	80	20	100	4
M.Sc 2P1	Operating Systems Lab	--	3	80	20	100	1.5
M.Sc 2P2	Web Technologies Lab	--	3	80	20	100	1.5
M.Sc 2P3	Business English	--	3				--
Total						700	20

COURSE STRUCTURE FOR M.Sc(CS)- III SEMESTER
(W.e.f. 2021 – 2022 Batch)

Code	Name of the Subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Lab	External	Internal		
M.Sc 3T1	Artificial Intelligence	4	--	80	20	100	4
M.Sc 3T2	Big Data Analytics	3	--	80	20	100	3
M.Sc 3T3	Software Testing	4	--	80	20	100	4
M.Sc 3T4	**Elective1** 1.Internet of Things 2.Information Security 3.Soft Computing	3	--	80	20	100	3
M.Sc 3T5	**Elective2** 1.Blockchain Technology 2. Mobile Application Development 3.Cloud Computing	3	--	80	20	100	3
M.Sc 3T1	Artificial Intelligence Lab	--	3	80	20	100	1.5
M.Sc 3T2	Big Data Analytics Lab	--	3	80	20	100	1.5
Total						700	20

COURSE STRUCTURE FOR M.Sc(CS)- IV SEMESTER
(W.e.f. 2021 – 2022 Batch)
Project Work

Code	Name of the Subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Lab	External	Internal		
M.Sc4P1	**Elective – I (MOOCs)** 1.Reinforcement Learning 2.Digital Marketing 3.Data Mining and Business Intelligence 4.Web Designing 5.Computer Networking	--	--				4
M.Sc4P2	**Elective – II (MOOCs)** 1.Deep Learning 2.Cyber Security 3.Natural Language Processing 4.Data Analytics 5.Data Science	--	--				4
M.Sc4P3	Project Work	--	--	150	50	200	12
Total						200	20

Paper-1: MATHEMATICAL FOUNDATIONS OFCOMPUTER SCIENCE

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

UNIT- I
Statements and Notation, Connectives- Negation, Conjunction, Disjunction, Conditional and Biconditional, Statement formulas and Truth Tables. Well-formed formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications. Normal Forms: Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms (PDNF), Principal Conjunctive Normal Forms (PCNF), Ordering and Uniqueness of Normal Forms.

UNIT-II
Set Theory: Basic concepts of Set Theory, Representation of Discrete structures, Relations and Ordering, Functions, Recursion.
Lattices and Boolean Algebra: Lattices as Partially Ordered Sets, Partial order relation, poset - Lattices, Hasse diagram, Boolean Functions, Representation and Minimization of Boolean Functions.

UNIT-III
Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutations and Combinations with constrained Representations, Binomial Coefficients, The Binomial and Multinomial Theorems, The Principle of Inclusion and Exclusion.

UNIT-IV
Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of Generating
Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The method of Characteristic Roots, Solution of Inhomogeneous Recurrence Relations.

UNIT-V
Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring. Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

Text Books:
1. Joe L. Mott. Abraham Kandel and Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 2nd Edition, Pearson, 2008.
2. J P Trembly and R Manohar, "Discrete Mathematical Structures with Applications to Computer Science", 1st Edition, McGraw Hill, 2017.
Reference Books:
1. Ralph P. Grimaldi and B.V. Ramana, "Discrete and Combinatorial Mathematics, an Applied Introduction", 5th Edition, Pearson, 2016.

2. Narsingh Deo, "Graph Theory with Applications to Engineering", Prentice Hall, 1979.
3. D.S. Malik and M.K. Sen, "Discrete Mathematics theory and Applications", Ist Edition, Cenegage Learning, 2012.
4. C L Liu and D P Mohapatra, "Elements of Discrete Mathematics, A computer Oriented approach", 4th edition, MCGRAW-HILL, 2018.

Paper-2: DATABASE MANAGEMENT SYSTEMS

M.Sc(CS) SEMESTER - I   **L-T-P-C: 3-0-0-3**

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 RamezElmasri, 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

Paper-3: PYTHON PROGRAMMING

M.Sc(CS) SEMESTER - I   **L-T-P-C: 4-0-0-3**

Unit – I

Introduction: What is a program, Running python, Arithmetic operators, Value and Types. **Variables, Assignments and Statements:** Assignment statements, Script mode, Order of operations, string operations, comments.

Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

Unit – II

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.

Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types.

Unit – III

Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.

Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

Case Study: Reading word lists, Search, Looping with indices.

Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

Unit – IV

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.

Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying. Classes and Functions:

Unit – V

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning **Classes and Methods:** Object oriented features, Printing objects, The init method, The __str__method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

 The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args,

Text books:

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.

Reference Books:

1. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.

2. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.

3. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019

Paper-4: DESIGN AND ANALYSIS OF ALGORITHMS

M.Sc(CS) SEMESTER - I   **L-T-P-C: 4-0-0-3**

UNIT I
Introduction: Algorithm, Algorithm specification, Performance analysis. Divide andConquer: General method, Binary Search, Finding the maximum and minimum,Merge sort, Quick Sort, Selection, Strassens matrix multiplication.

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

UNIT III
Basic Traversal and Search Techniques: Techniques for binary trees, Techniques forGraphs, Connected components and Spanning trees, Bi-connected components andDFS 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 boundsthrough reductions – Multiplying triangular matrices, inverting a lower triangularmatrix, 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 ComputerAlgorithms", 2nd Edition, 2012, University Press.
2. ParagHimanshu Dave and HimanshuBhalchandra Dave, "Design and Analysis ofAlgorithms", Second Edition, Pearson Education.

Reference Books
1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", ThirdEdition, 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 andAlgorithms", Pearson Education, Reprint 2006.
4. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 PearsonEducation, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition,Springer, 2008.

Paper-5: COMPUTER ORGANIZATION

M.Sc(CS) SEMESTER - I   **L-T-P-C: 3-0-0-3**

UNIT I
Basic Structure of Computers: ComputerTypes, 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
Parallel Processing: Basic concepts, Pipeline Processors, Multiprocessors

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.

Paper-1: OPERATING SYSTEMS

M.Sc(CS) SEMESTER - II   **L-T-P-C: 3-0-0-3**

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 Siliberschatz, Peter Baer Galvin, Greg Gagne, John Wiley &Sons, Inc., Edition 9, 2011
2. Introduction to UNIX and Shell Programming, M. G. Venkateshmurhty, 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-2: WEB TECHNOLOGIES

M.Sc(CS)-SEMESTER - II **L-T-P-C: 3-0-0-3**

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.

Paper-3: SOFTWARE ENGINEERING

M.Sc(CS)-SEMESTER - II   **L-T-P-C: 3-0-0-3**

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-4: COMPUTER NETWORKS

M.Sc(CS)-SEMESTER - II   **L-T-P-C: 3-0-0-3**

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-5: 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-reduceparsing, SLR Parsing, Canonical LR(1) parsers, LALR parsers, Using ambiguous grammars,YACC tool.

Unit – III: Syntax Directed Translation: Syntax Directed Definitions, Evaluation orders forSDD's, Application of SDT, SDT schemes, Implementing L-attributeSDD'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 BasicBlocks, The Principal Sources of Optimization, Introduction to Data-Flow Analysis, ConstantPropagation, 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.CompilersPrinciples,TechniquesandTools,SecondEdition,AlfredV.Aho,MonicaS.Lam,
RaviSethi, Jeffrey D. Ullman,Pearson.
2. CompilerDesign‖, K.Muneeswaran., Oxford UniversityPress, 2012

Reference Books:

1. CompilerConstruction‖, K.V.N Sunitha,Pearson, 2013
2. Engineering ACompiler‖, Second Edition, Keith D. Cooper &Linda Torczon., MK(Morgan Kaufmann)(ELSEVIER)
3. CompilersPrinciplesandPractice‖, ParagH.Dave, HimanshuB. Dave.,PEARSON
4. CompilerDesign‖, SandeepSaxena, RajkumarSingh Rathore.,S.Chandpublication
5. CompilerDesign‖, SantanuChattopadhyay., PHI
6. Principals of Compiler Design‖, NadhniPrasad, Elsevier

Paper-1: ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

M.Sc(CS) SEMESTER - III   **L-T-P-C: 3-0-0-3**

Unit-1

Foundations of AI: Introduction to Artificial Intelligence: Definition, foundations and history, some application areas); Agents: Intelligence agents, agents and evironments, structure of agents)

Unit-2

Problem solving: Problem solving agents, Sample problems, Searching for solutions, search strategies; Knowledge representation: ontological engineering, categories and objects, reasoning systems for categories

Unit-3

Introduction to Machine Learning. Definition of Machine learning (Tom Mitchel's), patterns, features, pattern representation, concept learning and inductive bias

Unit-4

Learning from data: Supervised, Unsupervised, Semi-supervised and self-supervised learning. Concepts of Classification and Regression. Supervised classification – logistic regression, perceptron, support vector machines, nearest neighbor classifier, decision trees. Clustering – K-means, Hierarchical clustering, DBSCAN

Unit-5

Learning probabilistic models: Statistical learning, Learning with Complete data, learning with hidden variables, EM algorithm; Bayesian models.

Text Books:

1. "Artificial Intelligence – A modern Approach". Stuart J. Russel and Peter Norvig. Pearson.

2. "Machine Learning", Tom Mitchel

References:

1. "Pattern Recognition", V. Susheela Devi, M.N.Murty. Universities Press.

2. Bill Franks, Taming the big Data tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons, 2012.

3. Glenn J. Myatt, Making Sense of Data , John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.

4. Jiawei Han, MichelineKamber, Data Mining Concepts and Techniques, Second Edition.

Paper-2: BIG DATA ANALYTICS

M.Sc(CS) SEMESTER - III   **L-T-P-C: 3-0-0-3**

UNIT- I

Introduction to Big Data. What is Big Data? Why Big Data is Important. Meet Hadoop Data, Data Storage and Analysis, Comparison with Other Systems, Grid Computing. A brief history of Hadoop. Apache Hadoop and the Hadoop Ecosystem.

UNIT-II

The design of HDFS. HDFS concepts. Command line interface to HDFS. Hadoop File systems. Interfaces. Java Interface to Hadoop. Anatomy of a file read. Anatomy of a file writes. Replica placement and Coherency Model. Parallel copying with distcp, keeping an HDFS cluster balanced.

UNIT-III

Analyzing data with Hadoop. Java MapReduce classes (new API). Data flow, combiner functions, Running a distributed MapReduce Job. Configuration API. Setting up the development environment. Managing configuration. Writing a unit test with MRUnit. Running a job in local job runner. Running on a cluster, Launching a job. The MapReduce WebUl.

UNIT-IV

Classic MapReduce. Job submission. Job Initialization. Task Assignment. Task execution, Progress and status updates. Job Completion. Shuffle and sort on Map and reducer side. Configuration tuning. Map Reduce Types. Input formats. Output formats. Sorting. Map side and Reduce side joins.

UNIT-V

The Hive Shell. Hive services. Hive clients. The meta store. Comparison with traditional databases. Hive QI. Hbasics. Concepts. Implementation. Java and Map reduce clients. Loading data, web queries.

Text Books:

1. Tom White, Hadoop, "The Definitive Guide", 3rd Edition, O'Reilly Publications, 2012.

2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Thomas Deutsch, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st Edition, TMH,2012.

References:

1. Bart baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley publications.

2. Howard Wen, "Big Ethics for Big Data", O'Reilly Media

Paper-3: MOBILE APPLICATION DEVELOPMENT

M.Sc(CS) SEMESTER - III   **L-T-P-C: 3-0-0-3**

Unit- I

Fundamentals of java for android application development: introduction to java, working with java tokens, knowledge check-1, explaining data types, declaring variables, declaring classes, declaring methods, creating objects, interfaces, inheritance, implementing flow control statements.

Getting an overview of android: Introducing android, discussing about android applications, the manifest file, downloading and installing android, exploring the development environment, developing and executing the first android application

Unit- II

Using Activities, Fragments, and Intents in Android: Working with activities, using intents, fragments, using the intent objects to invoke built-in Application.

Working with the user interface using views and ViewGroup: Working with view groups, binding data with the AdapterView class, designing the AutoTextCompleteView, implementing screen orientation, designing the views programmatically, handling UI events, specialized fragments, creating menus.

Unit- III

Handling pictures and menus with views: Working with image views, designing context menu for image view, using the AnalogClock and digitalclock, embedding web browser in an activity, notifying the user.

Storing the data persistently: introducing the data storage options, using the internal storage, using the external storage, using the SQLite database, working with content providers.

Emailing and Networking with android: building an application to send email, networking in android, checking network availability, consuming JSON services, socket programming.

Unit- IV

Working with location services and maps: working with google maps, working with geocoding and reverse geocoding.

Working with graphics and animation: Working with graphics, using the drawable object, using the ShapeDrawable object, working with the NinePatchDrawable graphics, understanding the concept of hardware acceleration, working with animation.

Unit- V

Audio, Video, and Camera: Role of media playback, using media player, recording and playing sound, creating a sound pool, using camera for taking pictures, recording video. **Bluetooth, NFC, and Wi-Fi:** Working with Bluetooth creating an application using Bluetooth functionality, connecting the devices using Bluetooth for data transfer, working with Bluetooth low energy, working with NFC, working with Wi-Fi.

Telephony and SMS: handling telephony, handling SMS, sending SMS Using SmsManager.

Text Book:

1. Pradeep Kothari, "Android Application Development(with KitKat Support)", dreamtech press.

Reference Book:

1. Reto Meier, "Professional Android 4 Application Development", John Wiley & Sons, Inc.

2. Wei-Meng Lee, "Beginning Android 4 Application Development", Wiley India.

Paper-4: INTERNET OF THINGS

M.Sc(CS) SEMESTER - III   (Elective-1)   **L-T-P-C: 3-0-0-3**

UNIT I

Overview of IoT: The Internet of Things: An Overview, The Flavor of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things? Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances. Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open source Vs Close source, Tapping into the community.

UNIT II

Embedded Devices: Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always-on Internet of Things

UNIT III

Communication in the IoT: Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol

UNIT IV

Business Models: A short history of business models, The business model canvas, Who is the business model for, Models, Funding an Internet of Things startup, Lean Startups. Manufacturing: What are you producing, Designing kits, Designing printed circuit boards.

UNIT V

Manufacturing continued: Manufacturing printed circuit boards, Mass-producing the case and other fixtures, Certification, Costs, Scaling up software. Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions.

Text Book:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012

Reference Books:

1. Arshdeep Bahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.

2. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

Reference sites:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/

Paper-4: SOFT COMPUTING

M.Sc(CS) SEMESTER - III (Elective-1) **L-T-P-C: 3-0-0-3**

Unit - I :

Artificial Intelligence: AI Problems, Techniques, Problem Spaces, Pattern and Data Search Techniques: Generate and Test, Hill Climbing, Best First Search Problem reduction. Knowledge Representation using Predicate Logic and Rules Introduction: Hard Computing and Soft Computing. Characteristics of Neural Networks: Biological Neural Networks and Features, Performance of Computer and Biological Neural Networks

Unit – II:

Artificial Neural Networks: Introduction, Basic models of ANN, important technologies Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back propagation Network, Associative Memory Networks, Training Algorithms for pattern association, BAM and Hopfield Networks

Unit – III :

Unsupervised Learning Network: Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohenen-Self-Organizing Featue Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks, Special Networks-Introduction o various networks Unit – IV : Introduction to Classical Sets (crisp sets) and Fuzzy Sets: operations and Fuzzy sets. Classical Relations and Fuzzy Relations-Cardinality, Operations, Properties and composition, Tolerance and equivalence relations. Membership functions: Features, Fuzzifications, membership value assignments, Defuzzification

Unit – V :

Fuzzy arithmetic and Fuzzy Measures, Fuzzy Rule Base and Approximate Reasoning Fuzzy Decision making and Fuzzy Logic Control System. Genetic Algorithm: Introduction and basic operators and terminology. Applications: Optimization of TSP, Internet Search Techniques

Text Books :

1. Principles of Soft Computing- S N Sivanandam, S N Deepa, Wiley, India, 2007.

2. Soft Computing and Intelligent System Design- Fakhreddine O Karry, Clarence D Silva, Pearson Edition, 2004.

Reference Books :

1. Artificial Intelligence and SoftComputing- Behavioural and Cognitive Modelling of the Human Brain- Amit Konar, CRC press, Taylor and Francis Group.

2. Artificial Intelligence – Elaine Rich and Kevin Knight, TMH, 1991, rp2008.

3. "Soft Computing" Sameer Roy, Pearson Education,2013. 4

. A first course in Fuzzy Logic-Hung T Nguyen and Elbert A Walker, CRC. Press Taylor and Francis Group.

5. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford Univ. Press

6. "Artificial Intelligence and Neural Networks" Umarao, Pearson-Sangune

Paper-5: BLOCK CHAIN TECHNOLOGIES

M.Sc(CS) SEMESTER - III   **(Elective-2)**   **L-T-P-C: 3-0-0-3**

UNIT-I

Blockchain : Distributed systems, the history of blockchain, introduction to blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. Decentralization: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies, Decentralized applications, Platforms for decentralization.

UNIT-II

Cryptography and Technical Foundations: Introduction, Cryptography, Confidentiality, Integrity, Authentication, Cryptographic primitives, Cryptographic primitives, Public and private keys, Financial markets and trading.

UNIT-III

Bitcoin: Bitcoin, Transactions, Blockchain, Bitcoin payments, Bitcoin programming and the command-line interface, Bitcoin improvement proposals (BIPs). Alternative Coins: Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin

UNIT-IV

Smart Contracts: History, Definition, Ricardian contracts Ethereum : Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts, Accounts, Block.

UNIT-V

Hyperledger: Projects, Hyperledger as a protocol, Fabric, Hyperledger Fabric, Sawtooth lake, Corda

Text Book:

1. Imran Bashir, "Mastering Blockchain" Packt Publishing Ltd, March 2017.

Reference Books

1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

2. Melanie swan, "Blokchain blueprint for a new economy", O'REILLY .

3. Andreas Antonopoulos, The internet of money, 2016

4. Paul Vigna & Michael J. Casey, The age of cryptocurrency, 2015

Paper-5: SOFTWARE TESTING

M.Sc(CS) SEMESTER - III   (Elective-2)   **L-T-P-C: 3-0-0-3**

UNIT-I:

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT-II:

Transaction Flow Testing: transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing. Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT-III:

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing: Overview, decision tables, path expressions, kv charts, specifications.

UNIT-IV:

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT-V:

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

TEXT BOOKS:

1. Software Testing techniques - Baris Beizer, 2nd edition, Dreamtech.

2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

REFERENCE BOOKS:

1. The craft of software testing - Brian Marick, Pearson Education.

2. Software Testing Techniques – SPD(Oreille).

3. Software Testing in the Real World – Edward Kit, Pearson.

4. Effective methods of Software Testing, Perry, John Wiley.

5. Art of Software Testing – Meyers, John Wiley

Paper-5: CLOUD COMPUTING

M.Sc(CS) SEMESTER - III   **(Elective-2)**   **L-T-P-C: 3-0-0-3**

Unit-1

Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Unit-2

Cloud Services and Platforms : Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity & and Access Management services, Open Source Private Cloud software.

Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Unit-3

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for Map Reduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.

Cloud Application Development in Python: Design Approaches, Image Processing APP, Document Storage App, Map Reduce App, Social Media Analytics App.

Unit-4

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.

Cloud Application Benchmarking and Tuning: Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.

Unit-5

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity & Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare &Education: Cloud Computing for Healthcare, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating into a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven –step model of migration into a cloud.

Text Books:

1. Cloud computing A hands-on Approach‖ By ArshdeepBahga, Vijay Madisetti, Universities Press, 2016

2.Cloud Computing Principles and Paradigms: By Raj kumarBuyya, James Broberg, AndrzejGoscinski, wiley, 2016

References:

1. Mastering Cloud Computing by RajkumarBuyya, Christian Vecchiola,SThamaraiSelvi, TMH

2. Cloud computing A hands-On Approach by ArshdeepBahga and Vijay Madisetti.

3. Cloud Computing : A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, TataMcGraw Hill, rp2011.

4. Enterprise Cloud Computing, GautamShroff, Cambridge University Press, 2010.

5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly, SPD, rp2011.

6. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press