DEPARTMENT OF COMPUTER SCIENCE

S.V UNIVERSITY COLLEGE OF CM&CS

REVISED CURRICULUM FOR MCA PROGRAMME WITH EFFECT FROM

2025-2026

SRI VENKATESWARA UNIVERSITY, TIRUPATI – 517502

INDIA

SRI VENKATESWARA UNIVERSITY, TIRUPATI

Department of Computer Science

REVISED CURRICULUM FOR MCA PROGRAMME WITH EFFECT FROM 2025–2026

SEMESTER -I											
S.No	Category	Course Code	Course Title	Scheme of Instruction (Hours/Week)					Scheme of Evolution		
				L	**T**	**P**	Total Hours	No. of Credits	Sessional Marks	Semester End Examination Marks	Total
1	CC	MCA 101	101 Computer Organization and Architecture	4	0	0	4	4	30	70	100
2	CC	MCA 102	102A- Programming in Python 102B- Object oriented Programming with Advanced Java	3	1	0	4	3	25	50	75
3	CC	MCA 103	103A- Operating Systems 103B- System Programming	3	1	0	4	3	25	50	75
4	SOC	MCA 104	104A- Mathematics for Computer Applications 104B- Computer Oriented Operations Research	3	1	0	4	3	25	50	75
5	SOC	MCA 105	105A- Accounting and Financial Management 105B- Accounting Essentials for Computer Applications	3	1	0	4	3	25	50	75
6	OOTC	MCA 106	Open Online Transdisciplinary Course - 1	-	-	-	-	2	-	-	-
7	P	MCA 107P	Programming in Python/ OOPs with Advanced Java Programming Lab	0	0	6	6	3	25	50	75
8	P	MCA 108P	Operating System / System Programming Lab	0	0	6	6	3	25	50	75
9	P	MCA 109P	Computer Organization / Computer Oriented Operations Research Lab	0	0	6	6	3	25	50	75
10	Audit Course	MCA 110 Audit Course	Indian Knowledge Systems - 1	4	0	0	4	0	0	0	0
Total							**42**	**27**	**205**	**420**	**625**

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SEMESTER -II											
S.No	Category	Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evolution		
				L	**T**	**P**	Total Hours		Sessional Marks	Semester End Examination Marks	Total
1	CC	MCA 201	201 Software Engineering	4	0	0	4	4	30	70	100
2	CC	MCA 202	202A- Data Structures 202B - Design and Analysis of Algorithms (DAA)	3	1	0	4	3	25	50	75
3	CC	MCA 203	203A- Advanced Database Management Systems 203B- NoSQL Database Management Systems	3	1	0	4	3	25	50	75
4	SOC	MCA 204	204A- Artificial Intelligence 204B – Natural Language Processing 204C - DevOps	3	1	0	4	3	25	50	75
5	OOTC	MCA 205	Open Online Transdisciplinary Course - 2	-	-	-	-	2	-	-	-
6	P	MCA 206P	Software Engineering Lab	0	0	6	6	3	25	50	75
7	P	MCA 207P	Data Structures Lab	0	0	6	6	3	25	50	75
8	P	MCA 208P	Advanced Database / NoSQL Database Management Systems Lab	0	0	6	6	3	25	50	75
9	Audit Course	MCA 209 Audit Course	Indian Knowledge Systems 2	4	-	-	4	0	0	0	0
Total							**38**	**24**	**180**	**370**	**550**

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SEMESTER -III											
S.No	Category	Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evolution		
				L	**T**	**P**	Total Hours		Sessional Marks	Semester End Examination Marks	Total
1	CC	MCA 301	301 Computer Networks	4	0	0	4	4	30	70	100
2	CC	MCA 302	302A- Data Warehousing and Data Mining 302B – Essentials of Data Science	3	1	0	4	3	25	50	75
3	CC	MCA 303	303A- Web Technologies 303B – Cloud Computing	3	1	0	4	3	25	50	75
4	SOC	MCA 304	304A- Block Chain Technologies 304B- Cryptography and Network Security	3	1	0	4	3	25	50	75
5	SOC	MCA 305	305A- Computer Graphics 305B – Digital Image Processing	3	1	0	4	3	25	50	75
6	P	MCA 306P	Web Technologies Lab	0	0	6	6	3	25	50	75
7	P	MCA 307P	Computer Graphics / Digital Image Processing Lab	0	0	6	6	3	25	50	75
8	P	MCA 308P	Minor Project Work	0	0	6	6	3	25	50	75
Total							**38**	**25**	**205**	**420**	**625**

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SEMESTER -IV											
S.No	Category	Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evolution		
				L	**T**	**P**	Total Hours		Sessional Marks	Semester End Examination Marks	Total
1	SOC	MCA 401	401A- Quantum Computing 401B - Bigdata Analytics 401C - Internet Of Things	3	1	0	4	4	30	70	100
2	OOSDC	MCA 402	Open Online Skill Development Course (NPTEL/ SWAYAM)	-	-	-	-	2	-	-	-
3	P	MCA 403	Major Project Work with Technical Seminar	0	2	10	12	12	100	200	300
Total							**16**	**18**	**130**	**270**	**400**

Grand Total of the MCA PROGRAMME	**134**	**94**	**720**	**1480**	**2200**

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MCA I SEMESTER
MCA 101 Computer Organization and Architecture

UNIT I

Flip-flops – Registers and shift registers – counters – decoders – Multiplexers – PLDs – sequential circuits. Basic Structure of Computers. Functional UNITs – Basic operational concepts – Bus structures – performance – Multiprocessors and Multi computers – Historical Perspective.

UNIT II

Addressing Methods and Machine Program Sequencing: 1. Basic Concepts: –Memory locations and address, Main Memory operations, Instructions and Instruction Sequencing –Addressing Modes.

UNIT III

Input / Output organization: Accessing I/O Devices – Interrupts – Direct Memory Access-I/O Hardware-Standard I/O Interface.

UNIT IV

Memory System Concepts: – Semiconductor RAM Memories - Read only memories – Cache Memories – Performance Considerations –Virtual Memories: - Memory Management Requirements, Arithmetic: - Addition and subtraction of sign members – Design of fast adders – Multiplication of positive members – Signed operand multiplication – Fast multiplication – Integer division – Floating point numbers and operations.

UNIT V

Basic Processing UNIT: Concepts – execution of a complete instruction – Multiple – Bus organization – Hardware control – Micro Programmed Control. Pipelining: Concepts – Data hazards – Instruction hazards – Influence on Instruction sets - data path and control constructions.

Text Book:

1. Hamacher C, Vranesic Z, and Zaky S. Computer Organization, 5th edition, Mc Graw – Hill,2002.
2. 1. Stallings W, Computer Organization and Architecture, 6th edition. Parson Education, 2003.

Reference Books:

1. Yarbrough JM, Digital Logic – Applications and Design, Thomas Learning, 1997

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MCA 102A Programming in Python

Unit I: Introduction to Python

Python Fundamentals, Components of a Python Program, Features of Python, Python Virtual Machine (PVM), Memory Management in Python, Garbage Collection in Python. Installing Python for Windows, Verifying the Path to Python, Installing pandas, Verifying Installed Packages.

UNIT II: Data types and Operators

Comments in Python, Data types in Python, Sequences in Python, Sets, Literals, Constants, Strings and Characters, User-defined Data types, Identifiers and Reserved words. Operator: Arithmetic Operators, Assignment Operators, Unary Minus Operator, Relational Operators, Logical Operators, Boolean Operators, Bitwise Operators, Membership Operators, Identity Operators.

UNIT III: Control Statements and Arrays

Input Statements, Output statements, Command Line Arguments. Control Statements: if Statement, if … else Statement, if … elif … else Statement, The while Loop, The for Loop, Infinite Loops: Nested Loops, The else Suite; The break Statement, The continue Statement, The pass Statement, The return Statement. Arrays: Advantages of Arrays, Creating an Array, Types of Arrays, Mathematical Operations on Arrays, Dimensions of Arrays, Attributes of an Array

UNIT IV: Components and Functions

List: Creating Lists, Updating the Elements of a List, Concatenation of Two Lists, Repetition of Lists, Membership in Lists, Methods to Process Lists, Sorting, Nested Lists. Tuples: Creating Tuples, Accessing the Tuple Elements, Operations on Tuples, Functions to Process Tuples, Nested Tuples. Dictionaries: Operations on Dictionaries, Dictionary Methods, Passing Dictionaries to Functions, Ordered Dictionaries. Defining a Function, Difference between a Function and a Method, Calling a Function, Returning Results from a Function, Returning Multiple Values from a Function, Pass by Object Reference.

UNIT V: OOPS and Data Structures

Object Oriented Programming System (OOPS), Classes and Objects, Encapsulation, Abstraction, Inheritance, Polymorphism. Abstract Classes and Interfaces, Exceptions. Data structures: Linked list, stacks, Queues, DQueues. Date and Time, Python's Database Connectivity.

TEXT BOOK(S):

1. Python, The Complete Reference -- Martin C.Brown, MCGraw Hill Education.

REFERENCE BOOKS:

1. Core Python Programming, Second Edition, Dr. R. Nageswara Rao.
2. Python Programming with Design Patterns –James W.Cooper Pearson Addison-Wesley.
3. Python Programming using problem solving approach, Reema Thareja, second edition, Oxford University Press, India.

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MCA 102B- Object oriented Programming with Advanced Java

UNIT-I

Introduction: Object Oriented Programming Concepts, Features of Java Language, Architecture, Data Types, Variables, Operators, Control Structures, Arrays. Classes: Classes, Wrapper Classes, Constructors, Overloading of methods, Access control, Nested and Inner classes, Abstract classes. Inheritance: Inheritance basics, Using Super, Multilevel hierarchy, Method overriding, Dynamic method dispatch, Final with inheritance.

UNIT-II

Math Class and Methods, Packages and Interfaces, Exception Handling: fundamentals, exception types, uncaught exceptions, using try, nested try statements, throw, throws, Java built-in exceptions, user defined exceptions. Multithreading: Thread model, main thread, creating a thread, Multiple threads, Thread priorities, synchronization, Inter thread communication, String handling.

UNIT-III

Wrapper Classes: Number class, Character class, Boolean class. More utility classes: Vector, Stack, Dictionary, Hash table. String Tokenizer, Bit set, Date, Calendar. Input/output: File, Stream classes, Byte Streams, Character Streams. GUI Programming.

UNIT-IV

Features Applets: Applet basics, Applet architecture, an applet skeleton, Applet display method, Repainting, Using Status window, HTML APPLET tag, passing parameters to applet, Audio Clip interface. Even Handling; two event handling mechanisms, Event model, Event classes, sources of events, Event Listener interfaces, Adapter classes. Introduction to SWING: Window Fundamentals, working with frame windows, creating window programs, working with color, fonts, SWING Controls, Layout Managers and Menus: Control fundamentals, Labels, using buttons, check boxes, checkbox group, choice controls, lists, scroll bars, Text field, layout managers, menu bars, and menus.

UNIT-V

Network Programming with Java: Networking classes and Interfaces, Internet Address, Factory method, Instance Methods, Sockets, Knowing IP address URL-URL Connection class. Creating a server that sends data, creating a client that receives data, two-way communications between server and client, Stages in a JDBC program, registering the driver, connecting to a database, Preparing SQL statements, improving the performance of a JDBC program.

Text Book

1. Herbert Scheldt: “The Complete Reference Java ”(Eighth Edition),TMH.

Reference Books

1. Dietel & Dietel : “Java2 How to Program”, Prentice Hall.
2. Thamus Wu: “An Introduction to Object Oriented Programming With Java.” TMH
3. Balagurusamy:”Programming With Java”: TMH.

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MCA 103A: Operating Systems

UNIT I

Introduction: System Components, System Organization, Structure and operation and Protection and Security. System Structures: System services, System Interface, System calls and types, System Programs, System Design and Implementation, System structure Operating system structures: System components, Operating System services, System calls, System programs, Virtual machines. Processes: Processes Concept, Processes Scheduling, Operations in processes, Inter processes communication, Communication in Client server systems. Multithreaded Programming: Overview, Multithreading Models, Threading Issues.

UNIT II

CPU Scheduling: Scheduling criteria, Scheduling Algorithms, Multiple processor Scheduling. Process Synchronization: - The critical-section problem, Synchronization hardware, Semaphores, Classic problems of Synchronization, Monitors. Dead Locks: Deadlock characterization, Deadlock handling, Deadlock prevention, Deadlock avoidance, Deadlock detection, and Recovery.

UNIT III

Memory Management: Swapping, Contiguous memory allocation, Paging, Structure of Page table, Segmentation. Virtual memory: Demand paging, Page replacement, Allocation of frames. File System Interface & Implementation: File concept, Access methods, Directory structure, File Sharing, Protection, File system structure, and implementation, Directory implementation, Allocation methods.

UNIT IV

Secondary Storage Structure: - Disk Structure Disk Scheduling, Disk management, Swap-space Management, RAID Structure.
I/O Systems: I/O hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O to Hard ware operations.

UNIT V

System Security: Security Problem, program threats, system and network threats, User Authentication.
Distributed Operating System: Motivation, Types of networks- based Operating systems, Network Structure, Network Topology, Communication Structure, Communication Protocols, Robustness and Design Issues.

Text Books:

1. Silberschatz A, Galvin P.B, and Gaghe G. Operating System Concepts, 8th edition, John Wiley, 2002.

Reference Books:

1. Tenenbaum A.S., Modern Operating Systems, 2nd edition, Pearson Education, 2001.
2. Dhamdhere D.M., Operating Systems – A concept-based Approach, Tata McGraw-Hill, 2002.

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MCA 103B- System Programming

UNIT I

Background introduction, system software and machine architecture, SIC, RISC, and CISC architecture. Assembler: basic assembler functions, machine dependent and independent assembler features, assembler design options, and implementation examples.

UNIT II

Loading and linkers basic loader junction, machine dependent and independent loader features, loader design options and implementation examples. Macro processors, basic macro processor functions machines – independent macro processor features, macro processor design options, implementation examples.

UNIT III

Compilers: basic compiler functions, machine dependent and independent compiler features, compiler design options and implementation examples. Other system software: text editors and interactive debugging systems

UNIT-IV

Introduction to Device Drivers, Design Issues-Types of Drivers, Character driver-1 and Design issues, Character Driver-2- A/D converter and its design issues, Block driver-1 and its design issues- RAM DISK driver-Anatomy-Prologue of drivers and programming Considerations.

UNIT-V

Introduction to Linux- Linux Architecture- X-windows- Linux administration tools - Commands to use Linux OS- Executing Linux Shell scripts – Shell Programming concepts-Shell scripts.

Text Books:

1. Leland. Beck, System Software: An Introduction to system programming:3/e, Pearson Educations Asia,2003. George pujari Writing Unix Drivers, Addison – Wesley, 1991.
2. Richard Petersen, Linux complete Reference, McGraw Hill Education (India) Private Limited; 6 editions (21 November 2007

Reference Books:

1. Dhamdhere, System programming and operation Systems Book 2/E, Tata Mc

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MCA 104A: Mathematics for Computer Applications

UNIT-I
Logic and Proof: Propositional Logic, Propositional Equivalent, Predicators and Quantifiers, Nested Quantifiers, Rules of Inference, Induction to Proofs, Proof Methods and Strategies.

UNIT-II
Induction and Recursion: Mathematical Induction, Strong Induction and Well Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms.

UNIT-III
Counting: The basics of counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, generalized permutations and Combinations, Generating Permutations and Combinations.

UNIT-IV
Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide and Conquer algorithms and Recurrence Relations, Inclusion – Exclusion, Applications of Inclusion – Exclusion.

UNIT – V
Graphs: Graphs And Graph Methods, Graph Terminology And Special Types of Graphs, Representing Graphs and Graphs Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring,

Text books

1. Discrete Mathematics and Its Applications, By Kenneth H Rosen, McGraw Hill, Sept.2002.

Reference Books

1. Discrete Mathematical Structures with Applications to Computer Science, By J.P.Tremblay, R.Manohar, McGraw Hill Pub, 1975.

2. Discrete Mathematics by N. Chandrasekaran and M. Umaparvathi, Prentice-Hall of India.

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MCA 104B: Computer Oriented Operations Research

UNIT-I

Linear Programming: Concept of Linear Programming Model, Development of LP Model, Graphical Method, Simplex Method, Duality, Formulation of Dual Problem, Application of Duality, (Text Book 1).

UNIT-II

Transportation Problem: mathematical Model for Transportation Problem, Types of transportation problem, Finding the Initial Basic Solution, Optimal Solution by U-V method, Assignment problem, Formulation of Assignment problem- Hungerian Method, Method of Solution, Branch and Bound Technique for Assignment Problem, (Text Book 1).

UNIT-III

Network Techniques: Shortest-Path Model, Systematic Method- Dijkstra's Algorithm, Floyid"s Algorithm, Minimum Spanning Tree Problem, Prime Algorithm, Krusakals Algorithm, Maximal Flow Problem, Linear Programming Modelling for Maximal Flow Problem, Maximal Flow Problem Algorithm, (Text Book 1).

UNIT-IV

Games and Strategies: Two –Person Zero- Sum Games, Maximin- Minimax Principle, Games Without Saddle Points- Mixed Strategies, Graphic Solution Of 2 x n, And m x 2 Games, Dominance Property, Arithmetic Model For n x n Games, General Solution For m x n Rectangular Games (Text Book 2).

UNIT – V

Queueing Theory: Queueing System, Elements of Queueing System, Operating Characteristics Of Queueing System, Classification of Queueing Models, (Text Book 2).

Text Books:

1. R.Pannerselvam., "Operations Research" 2nd Edition, Prentice-Hall of India

2. Kanti Swarup., P.K.Gupta and Man Mohan, ., "Operations Research" 12th Edition Sultan chand & Sons

Reference Books:

1. Taha H.A., Operations Research: An Introduction, Prentice-Hall of India

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MCA 105A: Accounting and Financial Management

UNIT I

Introduction to Financial Accounting Concepts: Definition and concepts, Significance, Branches of Accounting, Accounting Cycle- Journal – Ledger – Trial Balance – Final accounts.

UNIT II

Cost Accounting: Elements of Cost, Nature and significance – Cost classification and Allocation, Cost Sheet – Method of Inventory Valuation.

UNIT III

Financial Management: Meaning, scope and role. Financial Analysis through Ratios: Types of Ratios, Liquidity, Activity, Capital Structure and profitability ratio, Limitations of Ratios.

UNIT IV

Working Capital Management: Nature, Elements and Importance of working capital, types of working capital, Determinants of working capital.

UNIT V

Budgeting: Budgets, Purpose, Budgetary control, preparation of budgets, Types of budgeting methods, difference between Master Budget, fixed and flexible budgeting.

Text Books:

1. Rajeswara Rao K and Prasad G, Accounting & Finance (MCA), Jai Bharat Publishers, Guntur
2. Jain and Narang, *Cost Accounting*, Kalyani Publishers.

Reference Books:

1. Sharma R K, and Gupta S K, *Management Accounting*, Kalyani Publishers.
2. Financial Management Text and Problems: M.Y.Khan, P.K.Jain.
3. Financial Management Theory and Practices, Prasanna Chandra tata McGraw Hills.

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MCA 105B: Accounting Essentials for Computer Applications

UNIT I

Introduction to accounting Packages ms Excel as Accounting tool Features of MS Excel Function wizard Different categories of functions Date, numeric string, Accounting and Misc. Functions. An overview of accounting functions Auditing Tool in MS Excel.

UNIT II

Annual budgeting applications of spreadsheet preparation of cash budget preparation of Production budget - preparation of Flexible

Budget Preparation of projected profit and loss statement and proforma balance sheet. Introduction to Tally, Tally Features.

UNIT III

Cost Volume Profit Applications of Computer spreadsheet Pricing and product decisions including special order pricing, product addition and deletion and make or buy decisions.

UNIT IV

Financial accounting software package features of an accounting package voucher Entry Ledger preparation of Trail Balance, Profitand Loss Account and Balance using Tally. Sheet under specific package environment. Inventory accounting software package Basic Features Economic order quantity Maintenance of stock levels Stock valuation and reporting using Tally.

UNIT - V

Problems of Accounting Software Packages Security Problems Power problems Data integrity problems Computer virus problems of system adoptions.

Text books

1. Horngreen Introduction to Management Accounting, Prentice Hall
2. Smith, J.L. Keith, R.M. and Stemphens, W. L. Managerial Accounting, McGraw Hill

Reference Books

1. Guy Hart Davis, The ABCs of Microsoft Office, BPB Publications
2. Computer Accounting with Tally 7.2 Paperback – 2006 by Firewall Media
3. Implementing Tally 9/7.2/6.3 A.K.Nandhini ,K.K.Nandhini-First Edition 2007 BPB publications.

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MCA 201 Software Engineering

UNIT – I

Software Engineering – Introduction, Generic view of process, models, an agile view of process. Software Engineering practice – Software Engineering, communication, planning, modeling, construction practices and deployment.

UNIT-II

System Engineering – Computer-based systems, the system engineering Hierarchy, business process engineering, product engineering and system modeling. Building The Analysis Model – Requirement Analysis, Modeling Approaches, Data Modeling. Behavioral Model. The web engineering process, analysis models for web apps.

UNIT –III

Design Engineering-Design process and quality, design concepts the design model, and pattern-used software design. Architectural design – Software architecture, data design, architectural styles and patterns, architectural design mapping data flow into a software architecture. Component-based software engineering, Critical systems development, Software reuse, User interface design, web apps design issues and architecture design.

UNIT –IV

Testing strategies – Strategies and issues, testing strategies for and object-oriented software. Validation testing and system testing. Software testing tactics – Fundamentals, black-box and white- box testing white-box testing basis path testing. Control structure testing, black box testing, object- oriented testing methods. Testing methods applicable at the class level inter class testing case design. Testing for specialized environments, architectures and applications, web application testing – concepts, testing process, component level testing.

UNIT – V

Product metrics – Software quality, framework, metrics for analysis model design model, source case and testing. Managing software projects – The management spectrum, the W5 HH principle, metrics in process, software measurement, and metrics for software quality integrating metrics within the software process. Estimation – observations, decomposition techniques, empirical models, estimation for object-oriented projects other estimation techniques, project scheduling, risk management, reengineering,

Text Book:

1. 2. Roger, S, Pressman, Software Engineering, A Practitioner‟s Approach, Six Edition, McGraw- Hill, International Edition, 2005. Ian Sommerville, Software Engineering, Pearson Education, 8th Edition.

Reference Books:

1. 2. 3. James F Peters, Software Engineering, John Wiley Waruan S Jawadekar, Software Engineering, Tata McGraw Hill, 2004. Carlo Ghezzi, Mehdi Jazayeri, Dino Manrioli, Fundamentals of Software Engineering, PHI, 2001 Pankaj Jalote, An Integrated approach to Software Engineering Narosa.

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MCA 202A- Data Structures

UNIT I

Linear Data Structures: Abstract Data Types - Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Definition and an example – Arrays and its representations – Stacks and Queues – Linked lists – Linked list-based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.

UNIT II

Non-Linear Data Structures; Trees – Binary Trees – Binary tree representation and traversals – Threaded binary trees – Binary Search Tree-Insertion, Deletion, Searching, AVL Trees-Insertion, Deletion, Searching, Red-Black-Trees- Insertion, Deletion and Splay Trees.

UNIT III

Graph and its representations – Graph Traversals DFS and BFS – Connected components, Applications of Graphs-Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem.

UNIT IV

Sorting: Insertion sort – Merge sort – Quick sort – Heap sort – Radix Sort- Comparison of sorting algorithms in terms of Complexity - Sorting with disks – k-way merging – Sorting with tapes – Polyphase merge.

UNIT V

Searching And Indexing: Linear Search – Binary Search - Hash tables – Overflow handling – Cylinder Surface Indexing – Hash Index – B-Tree Indexing, B+ Trees.

Text Book:

1. Sartaj Sahni, Data Structures, Algorithms and Applications in Java, Second Edition, University Press.
2. Gregory L. Heilman, Data Structures, Algorithms and Object Oriented Programming, Tata Mcgraw-Hill, New Delhi, 2002.

References:

1. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, New Delhi, 1991.
2. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi, 2006.

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MCA 202B - Design and Analysis of Algorithms (DAA)

UNIT I

INTRODUCTION: Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation, recurrences, probabilistic analysis, disjoint set operations, union and find algorithms.

UNIT II

DIVIDE AND CONQUER: General method, applications-analysis of binary search, quick sort, merge sort, AND OR Graphs. GREEDY METHOD: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.

UNIT III

GRAPHS (Algorithm and Analysis): Breadth first search and traversal, Depth first search and traversal, Spanning trees, connected components and bi-connected components, Articulation points. DYNAMIC PROGRAMMING: General method, applications - optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

UNIT - IV

BACKTRACKING: General method, Applications- n-queen problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles. BRANCH AND BOUND: General method, applications - travelling sales person problem, 0/1 knapsack problem- LC branch and bound solution, FIFO branch and bound solution.

UNIT - V

NP-HARD AND NP-COMPLETE PROBLEMS: Basic concepts, non-deterministic algorithms, NP-hard and NP-complete classes, Cook‘s theorem.

TEXT BOOKS:

1. *Aho, Ullman, Hopcroft (2009), Design and Analysis of algorithms, 2nd edition, Pearson education, New Delhi*

REFERENCE BOOKS:

1. R. C. T. Lee, S. S. Tseng, R.C. Chang and T. Tsai (2006), Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill, India.

2. Allen Weiss (2009), Data structures and Algorithm Analysis in C++, 2nd edition, Pearson education, New Delhi.
3. Ellis Horowitz, Satraj Sahni, Rajasekharam (2007), Fundamentals of Computer Algorithms, 2nd edition, University Press, New Delhi.

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MCA 203A- Advanced Database Management Systems

UNIT-I

Introduction: Database- System Application – Purpose of Database Systems – View of Data – Database Languages– Relational Databases – Database Design–Object– based and Analysis – Database Architecture. Entity Relationship Model-Constraints-Entity-Relationship Diagrams, Design Issue-Weak Entity Sets-Database Design for Banking Enterprise and Unified Modeling language. Structure of Relational Databases -Relational Algebra Operation– Modification of the Database.

UNIT-II

SQL: Data Definition- Structure of SQL Queries- Set Operations- Aggregate Functions- Nested Sub queries- Complex Queries – SQL Data Types and Schemas- Integrity Constraints- Authorization- Embedded SQL- Dynamic SQL- -Authorization in SQL. PL/SQL Programming: Introduction, Control structures, Functions, Exception handling, Cursors, Triggers, Package.

UNIT-III

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Normal Forms, Functional-Dependency Theory, Algorithms for Decomposition using Functional Dependencies, Decomposition Using Multivalued Dependencies, More Normal Forms, Database–Design Process.

UNIT-IV

Object- Databases and XML: Object-based databases – Complex data types, structured types and inheritance in SQL, table inheritance, Varrays in SQL, object identity and reference types in SQL, implementing O-R features, Persistent programming languages, OO vs OR. XML – Structure of XML, Document Schema, Querying and Transformation, API in XML, XML applications.

UNIT-V

Transactions: Transaction concept, Transaction State-Implementation of Atomicity and Durability-Concurrent Executions- Serializability- Recoverability-Implementation of Isolation-Testing for Serializability, Concurrency Control: Lock Based Protocols-Timestamp-Based Protocols-Validation-Based Protocols-Multiple Granularity-Multiversion Schemes. Deadlock handling-Insert and Delete Operations-Weak Levels of Consistency-Concurrency in Index Structures.

Text Book:

1.Silberschatz A. Korth H F, and Sudarsan S, *Database System Concepts*, 5th edition, McGraw-Hill 2002.

Chapters 1to 4, 6 to 10 and 13 to 17)

2. SQL, PL/SQL: The Programming Language of Oracle by Ivan Bayross, BPB Publications, 2nd Revised Edition.

Reference Books:

1. Date C J,An Introduciton to Database Systems, 7th edition, Pearson Educaiton, 2000.

2. Elmasri R, and Navathe S B, Fundamentals of Database Systems, 4th edition, Pearson Education, 2004.
3. Mannino M V, Database Application Development and Design, McGraw-Hill, 2001.

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MCA 203B- NoSQL Database Management Systems

UNIT-I

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.

UNIT-II

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT-III

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT-IV

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT-V

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

TEXT BOOKS:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.
2. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015.

Reference Books:

1. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013.
2. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013.

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MCA 204A- Artificial Intelligence

UNIT I

Introduction Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT II

Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, best first search, A* algorithm, Game Search.

UNIT III

Probability, conditional probability, Constraint Satisfaction, Propositional Logic & Satisfiability, Uncertainty in AI, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.

UNIT IV

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially Observable MDPs.

UNIT V

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning. Introduction to Machine learning, Deep Learning.

Text Books

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Prentice Hall
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill

Reference Books

1. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011
2. David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”,Cambridge University Press 2010.

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MCA 204B – Natural Language Processing

UNIT- I

Overview of NLP applications and challenges, Phases of NLP (lexical, syntactic, semantic, discourse, pragmatic). Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches, Features

UNIT- II

Syntax I: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms. Syntax II: Models for Ambiguity Resolution in Parsing, Multilingual Issues Semantic.

UNIT- III

Parsing I: Introduction, Semantic Interpretation, System Paradigms, Word Sense. Semantic Parsing II: Predicate-Argument Structure, Meaning Representation Systems.

UNIT - IV

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter estimation, Language Model Adaptation, Language Models- class based, variable length, Bayesian topic based, Multilingual and Cross Lingual Language Modeling.

UNIT -V

Natural Language Processing with Python: NLTK, Language Processing and Python, Installing NLKT,Accessing Text Corpora and Lexical Resources, Processing Raw Text, Writing Structured Programs, Categorizing and Tagging Words, Learning to Classify Text, Extracting Information from Text, Analyzing Sentence Structure, Building Feature Based Grammars, Analyzing the Meaning of Sentences, Managing Linguistic Data.

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. https://www.nltk.org/book

REFERENCE BOOKS:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

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MCA 204C – DevOps

Unit - I: DevOps Definition- DevOps for Developers –Term DevOps- Introduction to DevOps Tradition and Agile Project Settings- Dev vs OPS – conflicts during and after deployments-conflicts in performance. Operations as bottleneck: Horizontal Optimization, Operation and ITSM- DevOps to rescue-essence of DevOps: values and processes, Tools.

Unit - II: Building blocks in DevOps: Measurement and Metrics, Traditional use of Metrics-Agile approach to metrics: Definition, broken agile metrics, quality changes. Improving flow of features: cycle, lead, takt time, throughput- Improve and accelerate delivery: Automatics Releasing-Pitfalls of Automation- Decoupled deployment and release- Metrics and Measurement view- Quality and Testing-teams and working agreements.

Unit-III: DevOps Area Matrix-Extend Development to Operations and vice versa, Embed development to Operation and vice versa. Unified and Holistic approach: starting concepts, Origins of conceptual deficit, Attributes of unified approach. Automatics Releasing: Prerequisite, Patterns with Appropriate Tools, Infrastructure as code: Test Environment with Vagrant, Provisioning with Puppet.

Unit–IV: Getting started with acceptance testing- defining acceptance criteria-Test Outcomes Configuration Management System: Installing Ansible – Install virtual box and Vagrant, Inventory file, Configurations options in inventory-inventory groups- inventory variable registration-dynamic and multiple inventory-installing word press.

Unit - V: Installing dependencies: MySQL, PHP, nginx - Task and Handlers- Ansible roles: Role Structure-Splitting up word press- Role Dependencies-wrapper Roles-variable locations-Ansible modules-writing module using Python.

TEXT BOOKS:

1. DevOps for Developers, Michael Hutterman, Apress

2. Ansible from Beginners to Pro-Michael Heap –Apress

REFERENCE BOOKS:

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations, Gene Kim, Jez Humble, Patrick Debois, and John Willis, IT Revolution Press.
2. Accelerate: The Science of Lean Software and DevOps Building and Scaling High Performing Technology Organizations, Nicole Forsgren, Jez Humble, and Gene Kim, IT Revolution Press.

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MCA 301: COMPUTER NETWORKS

UNIT I:

Data Communication: Components, Data Representation, Data Flow – Networks: Distributed Processing, Network Criteria, Physical Structure, Categories of Networks – Network Topologies - Network Models: OSI Reference Model, TCP/IP model.

Physical Layer: Data and Signals: Analog and Digital data, Analog and Digital Signal – Transmission Impairment- Performance - Multiplexing: FDM, WDM TDM - Transmission Media: Guided Media: Twisted-Pair cable, Coaxial Cable, Fiber-optic Cable, Unguided Media: Radio Waves, Microwaves, Infrared – Switching: Circuit Switching, Packet Switching.

UNIT II:

Data Link Layer: Data link layer design issues; Framing, Flow control and Error control; Error detection & correction: Parity, Checksum, CRC, hamming code; Wireless LAN's: IEEE 802.11, Bluetooth; Data link-layer Protocols: Stop-and-wait, Stop-and-wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ. Virtual-Circuit Networks: Frame relay, ATM.

UNIT III:

Network Layer: LOGICAL ADDRESSING: IPv4 addresses, IPv6 addresses; INTERNET PROTOCOL: IPv4, IPV6, Transition from IPv4 to IPv6: Dual Stack, Tunneling; Address Mapping: ARP, RARP, DHCP; Network layer Protocols – ICMP, IGMP; Routing – Unicast routing Protocols: RIP, OSPF, Link State Routing, Distance Vector Routing; Multicast Routing Protocols: DVMRP, MOSPF.

UNIT IV

Transport Layer: Process-to-Process Delivery: Introduction, UDP – User Datagram Format, UDP operations; TCP – Services, TCP segment Format, Flow control, Error Control, Congestion Control; Quality of service (QOS) and techniques to improve QOS. Security: Introduction. Symmetric-key and Asymmetric cryptography, Message security, Digital signature, User authentication, E-mail Security, Web security, Social Issues.

UNIT – V

Application Layer: The Domain Name System (DNS) – Distribution of Name Space, DNS in the Internet. Electronic Mail: Architecture and Services, POP3, SMTP, File Transfer: FTP, WWW and HTTP.

Text Books:

1. Forouzan B A, Data Communications and Networking, 4th edition, Tata McGraw-Hill, 2007.
2. Tanenbaum A S, Computer Networks, 4th edition, Pearson Education, 2003.
3. Ajay R. Mishra, Fundamentals of network planning and optimization, Willey,2nd edition,2018

Reference Books:

1. Stallings W, Data and Computer Communications, 7th edition, Pearson Education, 2004.
2. Gallo M A, and Hancock W M, Computer Communications and Networking Technologies, Thomson Brooks/Cole, 2002.

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MCA 302A- Data Warehousing and Data Mining

UNIT I

Data warehousing and OLAP**:** Data Warehouse basic concepts, Multidimensional Data Model- Stars, Snowflakes and Fact Constellations Schemas, OLAP Operations, A three- Tier Data Warehouse Architecture, Types of OLAP Servers: ROLAP versus MOLAP versus HOLAP and Data Warehouse Implementation.

UNIT II

Data Mining and its Applications**:** Introduction- Basic Data Mining tasks, Data mining versus Knowledge Discovery in Databases, Data Mining Issues, Data Mining Metrics. Data Pre-processing, Data cleaning, data integration, data reduction and data transformation.

UNIT III

Association Analysis: Basic Concepts and Algorithms**:** Frequent Item set Generation, Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for generating Frequent Item sets, FP Growth Algorithm, Evaluation of Association Patterns.

UNIT IV

Classification: Methods, improving accuracy of classification: Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbour Classifiers. Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of classification methods, Evaluation criteria for classification methods, Multiclass Problem.

UNIT V

Clustering Techniques: Overview: Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis.

Text Books:

1. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
2. Margaret H. Dunham: Data Mining- Introductory and Advance Topics, Pearson Edition, 2006.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison- Wesley, 2005.

Reference Books:

1. Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2009.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.
3. Alex Berson and Stephen J.Smith: Data Warehousing, Data Mining, and OLAP Computing McGrawHill Publisher, 1997

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MCA 302B – Essentials of Data Science

UNIT I

Introduction: What is Data Science? - Big Data and Data Science, Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model - Intro to R Language.

UNIT II

Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: Real Direct (online real estate firm)

UNIT III

Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests.

UNIT IV

Data Visualization: Basic principles, ideas and tools for data visualization 3 - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset.

UNIT V

Data Science and Ethical Issues - Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists

Text Books

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.

References Books

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.

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MCA 303 A- Web Technologies

UNITI

Introduction to Internet-Browser Architecture-IE: Chrome-Search Engines-Introduction to HTML-5-HTML-5 Tags-Audio, Video Tags – HTML-5 Forms-Controls-CSS Styling-CSS Tags-Attributes.

UNIT II

Java Script-JQuery: JavaScript Programming Scripts- Control structures- Functions-Document, Browser, Date, Math, String objects-Events- JQuery Libraries-JQuery Objects, Functions – JQuery Events-Animations.

UNIT III

AJAX Concepts: Simple AJAX objects-Ajax Libraries-Examples, Webservers IIS, Tomcat-Hosting Website in a Web server.

UNIT IV

Introduction to PHP: Control Structures-Arrays-Functions-Database Connectivity-Introduction to ZEND Framework and applications

UNIT-V

Introduction to Java Servlets: Servlet classes and interfaces - Java Database Connectivity-Introduction to JSP-Java Server Page script lets -JSP Objects-JSP Web applications.

Text Books:

1. Deitel, Deitel and Goldberg Internet & World Wide Wide how to program" by End. Pearson Education Ivan Bayross, Webenavled commercial Application Development in Java 2.0 BPB.
2. HTML 5 Black book, Kogent Learning Solutions Inc.

Reference Books:

1. Raj Kamal Internet and web Technologies, Tata McGraw Hill, 2002. Chirs Bates, Web Programming, John Wiley, 2nd Edition

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MCA 303B – Cloud Computing

UNIT-I

Cloud Architecture and Model: Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture, Cloud Models: Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public Vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

UNIT II

Virtualization: Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation. VMWare, Virtual Box Virtualization software.

UNIT III

Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources. Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation

UNIT IV

Programming Model: Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support – Software environments for service development; Amazon, Azure, GoogleApp Engine, AWS - Cloud Environments -Eucalyptus, Open Nebula, Open Stack, Aneka, CloudSim. Cloud Storage – Storage-as- a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT V

Security In TheCloud : Security Overview – Cloud Security Challenges and Risks – Software-as-a- Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control.

Text Books:

Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

2. Rittinghouse, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security‖, CRC Press, 2017.

Reference Books

1. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

2. Kumar Saurabh, "Cloud Computing – insights into New-Era Infrastructure", Wiley India,2011.

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MCA 304 A- Block Chain Technologies

Unit-I

Introduction to Blockchain Distributed systems, Types of blockchain, Blockchain Architecture – Challenges – Applications – Blockchain Design Principles -The Blockchain Ecosystem - The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - peer-to-peer network – Abstract Models - GARAY model - RLA Model - Proof of Work (PoW) - Proof of Stake (PoS) based Chains - Hybrid models.

Unit- II

Cryptography and Blockchain Hash functions, Digital signatures, Merkle trees, Public key infrastructure. Blockchain Components and Concepts - Block Header and Identifiers - Linking Blocks in the Blockchain - Mining and Consensus: Aggregating transactions into Blocks - Mining the Block - Validating and Assembling of Blocks, Selecting Chains of Blocks.

Unit-III

Origin of Ledgers – Types and Features of Distributed Ledger Technology (DLT) - Role of Consensus Mechanism - DLT Ecosystem - Distributed Ledger Implementations – Blockchain - Ethereum - Public and Private Ledgers – Registries – Ledgers - Practitioner Perspective: Keyless Technologies, Transparency as a Strategic Risk, Transparency as a Strategic Asset, Usage of Multiple IDs.

Unit - IV

Anatomy of a Smart Contracts - Life Cycle - Usage Patterns - DLT-based smart contracts -Use Cases: Healthcare Industry and Property Transfer. Implementation of Public and Private Blockchain.

Unit-V

Bitcoin architecture, Mining, Wallets, Transactions, Blockchain forks. Ethereum tokens – Augur – Golem - Understanding Ethereum tokens - App Coins and Protocol Tokens - Blockchain Token Securities Law Framework.

Text Books:

1. Dhillon, V., Metcalf, D., and Hooper, M, Blockchain enabled applications, 2017, 1st Edition, CA: Apress, Berkeley.
2. Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda, Beginning Blockchain, A Beginner's
Guide to Building Blockchain Solutions, 2018, 1st edition, Apress, New York

Reference Books

1. Diedrich, H., Ethereum: Blockchains, digital assets, smart contracts, decentralized autonomous organizations, 2016, 1st Edition, Wildfire publishing, Sydney.
2. Wattenhofer, R. P, Distributed Ledger Technology: The Science of the Blockchain (Inverted Forest Publishing)

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MCA 304B- Cryptography and Network Security

UNIT I

Cryptography – Terminology, Conventional Encryption Model, Steganography, Classical Encryption Techniques, DES Data Encryption Standard, Block Cipher Design principles and Modes of Operation.

UNIT II

Conventional Encryption Algorithms: Triples DES, International Data Encryption Algorithm, Blowfish, RC5, Characteristics of advanced symmetric Block Ciphers, Confidentiality using Conventional Encryption.

UNIT III:

Public-Key Cryptography, Introduction to Number Theory: Prime Numbers, Modular Arithmetic, Eulers Theorem, Primary and Factorization, discrete logarithm, D-H Key sharing technique, RSA and its variants-Homomorphic Encryption Techniques Message Authentication and Hash Functions – Hash and MAC algorithms.

UNIT IV

Digital, Signatures and authentication Protocols, Digital Signature Standard, Network Security Practice, Authentication Applications. Basic overview of Electronic Mail Security: pretty Good Privacy's /MIME: IP Security, Web Security – Intruders, Viruses and Worms – Firewalls.

UNIT V

Mobile Security, Risk Model, EcoSystem, Service Risks, App Risks, Countermeasures- Cloud Computing Security- Threats-Security in Cloud.Security at service layers. Introduction to Block chain, Crypto currency, BitCoin Security and working, *Ethereum*.

Text Books

1. Cryptography and Network Security – by William Stallings, Principles and Practice, 7th Edition, Pearson
2. Cryptography and Network Security, by John Wiley, Edn,.2001

Reference Books

1. Bruce Schneier, Applied Cryptography, John Wiley, Second Edn,2001.
2. Charke Kaufman, Rodia Perlman and Mike Speciner, Network Security

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MCA 305A- Computer Graphics

UNIT I

Overview of Graphics systems, Application areas of Computer Graphics, video-display devices, Raster-scan systems, random scan systems, graphics monitors and workstations and input devices. Output primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms.

UNIT II

Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms. 2-D Geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates.

UNIT III

2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT IV

3-D Object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces. Basic illumination models, polygon rendering methods.

UNIT V

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.
Computer Animation: Design of animation sequence, general computer animation functions, Raster animations, Computer animation languages, Key frame systems.

Text Books:

1. Donald Hearn and M.Pauline Baker, Computer Graphics C Version, Second Edition, Pearson Educations.2005.

Reference Books:

1.Steven Harrington (1987), Computer Graphics – A Programming Approach, Second Edition, Mc Graw – Hill International Editions.

2. William M. Newman and Robert F. Sprowli (1979), Principles of Interactive Computer Graphics, second Edition, Mc Graw – Hill International Editions.

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MCA 305B – Digital Image Processing

UNIT-1: **INTRODUCTION & FUNDAMENTALS**: Origin of DIP, examples of fields that use DIP, fundamentals of DIP, components of an DIP system, Image formation model, Spatial & Gray level resolution, Image enhancement in special domain: Piecewise transformation functions, Histogram equalization, Histogram specification, image averaging, spatial filters- smoothing and sharpening, Laplacian filter, Canny edge detector., image sampling and quantization, some basic relationships between pixels.

UNIT 2: **IMAGE ENHANCEMENT AND SEGMENTATION**: Image Enhancement in Spatial Domain: Background, some basic gray level transformations, Histogram processing, enhancement using arithmetic and logic operations, basic of spatial filtering, smoothing spatial filters, sharpening spatial filters. Image Enhancement in the Frequency Domain: Background, Introduction to FT and frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, additional properties of the 2-D FT, convolution, line detection, Edge Detection, Edge Linking and boundary detection, Global Thresholding, Ostu's method, multiple threshold, variable threshold, multivariant threshold, Region based Segmentation., Corner Detection, segmentation using Morphological watersheds.

UNIT 3: IMAGE COMPRESSION: Fundamentals, image compression models, elements of information theory, error free Compression, run length coding, Huffman coding, LZW coding, Arithmetic coding, LZW coding, symbol based coding, bit plane coding, predictive coding, wavelet coding, loss less predictive coding, lossy predictive coding, image compression standards, DCT, JPEG, MPEG video compression standards, watermarking.

UNIT 4: MORPHOLOGICAL IMAGE PROCESSING: Erosion, dilation, opening, closing, Basic Morphological Algorithms: hole filling, connected components, thinning, skeletons, some basic morphological algorithms, Gray scale Morphology.

UNIT 5: IMAGE REPRESENTATION, DESCRIPTION & RECOGNITION: Representation, Boundary descriptors, Regional descriptors, Principal component analysis, Recognition based on decision theoretic & structural methods. Optimum statistical classifiers, neural network, string matching, matching shape numbers.

Text Books:

1. Digital Image Processing by Rafael .C .Gonzalez and Richard. E, Pearson Education, 2010, 3rd Edition.

References Books:

1. Digital Image Processing – by William K. Pratt 3rd Edition John Wiley and Sons Inc.

2. P. Suetens, Fundamentals of image processing, Cambridge University Press, 2002.

3. R. C. Gonzalez, R. E. Woods, S. L. Eddins , Digital Image Processing Using MATLAB(R) ,Course Technology, 1 edition, 2004

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MCA 401A- Quantum Computing

Unit I:

History and Principles of Quantum Mechanics, Quantum States and Superposition Quantum Entanglement and interference. Qubits and Quantum Gates

Unit-II

Quantum Circuits -Basic Quantum Algorithms (e.g., Deutsch's Algorithm) – A General Model of a Quantum Computer

Unit- III

Quantum Algorithms and Complexity - Shor's Algorithm - Grover's Algorithm - Quantum Generative Adversarial networks.

Unit IV:

Variational Quantum Algorithms -Quantum Error Correction Codes -Fault-Tolerant Quantum Computation -Decoherence and Noise.

Unit V:

Introduction to Quantum Machine Learning - Quantum Cryptography concepts - Quantum Simulation and Quantum Annealing concepts- Quantum applications.

Textbooks:

1. Quantum Mechanics: The Theoretical Minimum by Leonard Susskind and Art Friedman
2. Quantum Computing for Everyone by Chris Bernhardt
3. Quantum Error Correction by Daniel A. Lidar and Todd A. Brun
4. Quantum Computing: A Gentle Introduction by Eleanor G. Rieffel and Wolfgang H. Polak

References:

1. Jack D. Hidary, Quantum Computing: An Applied Approach, Firstedition, Springer International Publishing, 2019
2. N. David Mermin, Quantum Computer Science: An Introduction Firstedition, Cambridge University Press, 2007

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MCA 401B - Bigdata Analytics

UNIT I

What is Big Data: Varieties of Data – Unstructured data – Trends in Data Storage - Basically Available Soft State Eventual Consistency (BASE) - Industry Examples of Big Data.

UNIT - II

Big Data Technology: New and older approaches – Data Discovery –Terminologies used in Big Data Environments- Open-Source technologies for Big Data Analytics – Cloud and Big Data – Big Data Foundation – Computation – Limitations – Big Data Emerging Technologies.

UNIT III

Business Analytics –Consumption of Analytics – Creation to Consumption of Analytics – Data visualization by Organizations – 90/10 rule of critical thinking – Decision sciences and analytics – Learning over knowledge – Agility – Scale and convergence – Privacy and security in Big Data.

UNIT IV

Predictive Analytics – Target Definition - Linear Regression – Logistic Regression - Decision trees – Neural Networks – Support Vector machines - Classification trees – Ensemble methods – Association Rules – Segmentation, Sequence Rules, Social Network analytics.

UNIT V

Hadoop – Why Hadoop? – Why not RDBMS? – RDBMS Versus Hadoop - Components of Hadoop – Hadoop File System – Hadoop Technologies Stack – Managing Resources and Applications with Hadoop YARN - Dataware housing Hadoop Concepts – Applications of Hadoop using PIG, YARN, HIVE.

Text Books

1. Big Data and Analytics, seema Acharya ,Subhashini chellapan, Wiley publicaitons
2. Baesens, 2014, Analytics in a Big Data World: The Essential Guide to Data Science and Its applications, Wiley India Private Limited.

Reference Books

"Big Data Analytics: Systems, Algorithms, Applications" **Prabhu**, C.S.R., **Sreevallabh Chivukula**, A., **Mogadala**, A., **Ghosh**, R., **Livingston**, L.M.J.

SRI VENKATESWARA UNIVERSITY, TIRUPATI
Department of Computer Science
REVISED CURRICULUM FOR MCA PROGRAMME WITH EFFECT FROM 2025–2026

MCA 401C – Internet Of Things

UNIT I

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

UNIT II

Sensors Networks: Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, Raspberry Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

UNIT III

Wireless Technologies for IoT**:** WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z- Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT: IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT.Edge connectivity and protocols.

UNI IV

Data Handling& Analytics**:** Introduction, Bigdata, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction to Hadoop. Introduction to data Analytics, Types of Data analytics, Local Analytics, Cloud analytics and applications, Edge/Fog Computing.

UNIT V

Applications of IoT**:** Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

Text Books:

1. Olivier Hersent, David Boswarthick, and Omar Elloumi, — "The Internet of Things: Key

Applications and Protocols", WileyPublications

2. Vijay Madisetti and ArshdeepBahga, — "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

Reference Books

1. Daniel Minoli, — "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press.