Total Credits = 23								
SEMESTER 1st		**Contact Hrs.**				**Marks**		**Credits**
Subject Code	Subject Name	**L**	**T**	**P**	Internal	External	Total	
MCAPS1-101	Computer Networks	3	1	0	40	60	100	4
MCAPS1-102	Relational Database Management System	3	1	0	40	60	100	4
MCAPS1-103	Object Oriented Programming Using C++	3	1	0	40	60	100	4
MCAPS1-104	Computer Organization and Architecture	3	0	0	40	60	100	3
MCAPS1-105	Business Communications	2	0	0	40	60	100	2
MCAPS1-106	Relational Database Management Lab	0	0	4	60	40	100	2
MCAPS1-107	Object Oriented Programming using C++ Lab	0	0	4	60	40	100	2
MCAPS1-108	Business Communications and Soft Skills Lab	0	0	4	60	40	100	2
Total					380	420	800	23

Total Credits = 23										
SEMESTER 2nd			**Contact Hrs.**				**Marks**		**Credits**	
Subject Code		Subject Name	**L**	**T**	**P**	Internal	External	Total		
MCAPS1-201		Data Structures	3	1	0	40	60	100	4	
MCAPS1-202		Operating System	3	1	0	40	60	100	4	
MCAPS1-203		Discrete Mathematics	3	0	0	40	60	100	3	
MCAPS1-204		Data Structures Lab	0	0	4	60	40	100	2	
MCAPS1-205		Operating System Lab	0	0	4	60	40	100	2	
Departmental Elective – I (Select any one)										
DE11	**MCAPD1-211**	Data Warehousing and Data Mining	3	0	0	40	60	100	3	
DE12	**MCAPD1-212**	Business Intelligence & Digital	3	0	0	40	60	100	3	
DE13	**MCAPD1-213**	Software Testing and Quality Assurance	3	0	0	40	60	100	3	
Departmental Elective – II (*Select a combination (Theory & Lab)*)**										
DE21	**MCAPD1-221**	Programming in Java	3	0	0	40	60	100	3	5
	MCAPD1-222	Programming in JAVA Lab	0	0	4	60	40	100	2	
DE22	**MCAPD1-223**	Programming with Python	3	0	0	40	60	100	3	5
	MCAPD1-224	Programming with Python Lab	0	0	4	60	40	100	2	
Total						380	420	800	23	

Note:
***Students have to select a combination of subjects from **DE21/DE22** as Departmental Elective–II :*
**Note:*
After 2nd Semester minimum 04 weeks Training in Institute/Industry.

Total Credits = 23									
SEMESTER 3rd			**Contact Hrs.**			**Marks**			**Credits**
Subject Code		Subject Name	**L**	**T**	**P**	Internal	External	Total	
MCAPS1-301		Artificial Intelligence	3	1	0	40	60	100	4
MCAPS1-302		Design and Analysis of Algorithms	3	1	0	40	60	100	4
MCAPS1-303		Information and Network Security	3	0	0	40	60	100	3
MCAPS1-304		Design and Analysis of Algorithms Lab	0	0	4	60	40	100	2
MCAPS1-305		Institute /Industrial Training	--	--	--	60	40	100	2
Departmental Elective – III (*Select a combination (Theory & Lab)**)**									
DE31	**MCAPD1-311**	LAMP Technologies	3	0	0	40	60	100	3
	MCAPD1-312	LAMP Technologies Lab	0	0	4	60	40	100	2
DE32	**MCAPD1-313**	Database Administration	3	0	0	40	60	100	3
	MCAPD1-314	Database Administration Lab	0	0	4	60	40	100	2
DE33	**MCAPD1-315**	Cloud Computing	3	0	0	40	60	100	3
	MCAPD1-316	Cloud Computing Lab	0	0	4	60	40	100	2
OP31	**XXXX**	Open Elective	3	0	0	40	60	100	3
Total						380	420	800	23

****Note:*
*Students have to select a combination of subjects from **DE31/DE32 /DE33** as Departmental Elective–III*

Total Credits = 20										
SEMESTER 4th			**Contact Hrs.**				**Marks**		**Credits**	
Subject Code		Subject Name	**L**	**T**	**P**	Internal	External	Total		
MCAPS1-401		Theory of Computation	3	1	0	40	60	100	4	
MCAPS1-402		Current Trends and Technologies	3	0	0	40	60	100	3	
MCAPS1-403		Software Project	0	0	6	80	120	200	3	
MCAPS1-404		Seminar	--	--	2	100	0	100	1 (Satisfactory/ Unsatisfactory)	
Department Elective- IV (*Select a combination (Theory & Lab)***)**										
DE41	**MCAPD1-411**	Big Data	3	1	0	40	60	100	4	5
	MCAPD1-412	Big Data Lab	0	0	2	60	40	100	1	
DE42	**MCAPD1-413**	Dot Net Framework	3	1	0	40	60	100	4	5
	MCAPD1-414	Dot Net Framework Lab	0	0	2	60	40	100	1	
DE43	**MCAPD1-415**	Mobile Computing & Android	3	1	0	40	60	100	4	5
	MCAPD1-416	Mobile Computing & Android Lab	0	0	2	60	40	100	1	

DE44	**MCAPD1-417**	Soft Computing	3	1	0	40	60	100	4	5
	MCAPD1-418	Soft Computing Lab	0	0	2	60	40	100	1	
Departmental Elective – V (*Select a combination (Theory & Lab)****)**										
DE51	**MCAPD1-421**	Machine Learning	3	0	0	40	60	100	3	4
	MCAPD1-422	Machine Learning Lab	0	0	2	60	40	100	1	
DE52	**MCAPD1-423**	Computer Graphics	3	0	0	40	60	100	3	4
	MCAPD1-424	Computer Graphics Lab	0	0	2	60	40	100	1	
DE53	**MCAPD1-425**	Fog Computing and Internet of Things	3	0	0	40	60	100	3	4
	MCAPD1-426	Fog Computing and Internet of Things Lab	0	0	2	60	40	100	1	
Total						460	440	900	20	

*****Note:*
*Students have to select a combination of subjects from **DE41/DE42/DE43/DE44** as Departmental Elective–IV*

******Note:*
*Students have to select a combination of subjects from **DE51/DE52/DE53** as Departmental Elective–V*

Bridge Course Subjects for Non-IT Background Students: -								
						Total Credits = 12		
Bridge courses		**Contact Hrs.**				**Marks**		**Credits**
Subject Code	Subject Name	**L**	**T**	**P**	Internal	External	Total	
MCAPS1-001	Software Engineering	3	1	0	40	60	100	4
MCAPS1-002	Digital Electronics	3	1	0	40	60	100	4
MCAPS1-003	Mathematical Foundations of Computer Science	3	1	0	40	60	100	4
Total		9	3	0	120	180	300	12

Overall

Semester	**Marks**	**Credits**
1st	800	23
2nd	800	23
3rd	800	23
4th	900	20
Total	**3300**	**89**

COMPUTER NETWORKS

Subject Code: MCAPS1-101 **LTPC** **Duration: 60 Hrs.**

3104

Course Objectives

After completion of this course, the students would be able to:

1. Independently understand basic computer network technology, data communication system and its components.
2. Identify the different types of network topologies, protocols, layers of the OSI model and TCP/IP.
3. Identify the different types of network devices and their functions within a network.
4. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

UNIT-I (17 Hrs.)

Introduction to Computer Networks - Data Communication System and its components,Data Flow, Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and wired networks, broadcast and point to point networks, Network topologies, Network software: concept of layers, protocols, interfaces and services, ISO-OSI reference model, TCP/IP reference model.

Physical Layer - Concept of Analog & Digital Signal, Bandwidth, TransmissionImpairments: Attenuation, Distortion, Noise, Data rate limits: Nyquist formula, Shannon Formula, Multiplexing: Frequency Division, Time Division, Wavelength Division, Introduction to Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching: Circuit Switching, Message Switching, Packet Switching & their comparisons.

UNIT-II (15 Hrs.)

Data Link Layer - Design issues, Framing, Error detection and correction codes: checksum,CRC, hamming code, Data link protocols for noisy and noiseless channels, Sliding Window Protocols: Stop & Wait ARQ, Go-back-N ARQ, Selective repeat ARQ, Data link protocols: HDLC and PPP.

Medium Access Sub-Layer - Static and dynamic channel allocation, Random Access:ALOHA, CSMA protocols, Controlled Access: Polling, Token Passing, IEEE 802.3 frame format, Ethernet cabling, Manchester encoding, collision detection in 802.3, Binary exponential back off algorithm.

UNIT-III (14 Hrs.)

Network Layer - Design issues, IPv4 classful and classless addressing, subnetting, Routingalgorithms: distance vector and link state routing, Congestion control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket and token bucket algorithms

UNIT-IV (14 Hrs.)

Transport Layer - Elements of transport protocols: addressing, connection establishmentand release, flow control and buffering, multiplexing and de-multiplexing, crash recovery, introduction to TCP/UDP protocols and their comparison.

Application Layer - World Wide Web (WWW), Domain Name System (DNS), E-mail, FileTransfer Protocol (FTP), Introduction to Network security.

Recommended Books

1. Andrew S. Tanenbaum, 'Computer Networks', 5th Edn., Pearson Education, **2010.**
2. Behrouz A. Forouzan, 'Data Communications & Networking', 5th Edn., Tata McGrawHill, **2012.**
3. James F. Kurose and Keith W. Ross, 'Computer Networking', 6th Edn., Pearson Education,**2013.**
4. Douglas E. Comer, 'Internetworking with TCP/IP, Volume-I', 6th Edn., Prentice HallIndia, **2013.**

RELATIONAL DATABASE MANAGEMENT SYSTEM

Subject Code: MCAPS1-102 **L T P C** **Duration: 60 Hrs.**

3104

Course Objectives

1. The course aims at providing the students through insight on few DBMS principles and practices.
2. Students will learn and implement the operations for making and using databases with help of SQL and PL/SQL.

UNIT- I (17 Hrs.)

Introduction to DBMS - Overview of DBMS, Basic DBMS terminology, Dataindependence. Architecture of a DBMS, Introduction to data models: Entity relationship model, Hierarchical model, Network model, Relational model.

Relational Design - Relation scheme, Codd's Rule for RDBMS, Anomalies in a database,Functional Dependency: Dependencies and Logical implications, Closure set, Testing if FD is in closure, Covers, Non redundant and Minimum cover, Canonical cover, Functional dependencies and Keys.

Normal Forms - INF, 2NF, 3NF, BCNF, Multi valued dependencies and Joineddependencies, 4NF, 5NF.

UNIT-II (15 Hrs.)

Structured Query Language - Introduction to SQL, Oracle server and Oracle database,Oracle data types, Starting SQL*Plus, querying database tables, Conditional retrieval of rows, working with null values, matching a pattern from a table, Ordering the result of a query, Aggregate Functions, Grouping the result of a query.

Querying multiple Tables - Equi Joins, Cartesian Joins, Outer Joins, Self Joins; SET Operators - Union, Intersect, Minus.

Functions - Arithmetic functions, Character functions, Date functions, and Group functions.

UNIT-III (14 Hrs.)

Data Manipulation and Control - Data Definition Language (DDL), Creating Tables,creating a Table with data from another table, Inserting Values into a Table, Updating Column(s) of a Table, Deleting Row(s) from a Table, dropping a Column; VIEW - Manipulating the Base table, Rules of DML Statements on Join Views, Dropping a VIEW, Inline Views.

Database security and privileges - GRANT command, REVOKE command, COMMIT and ROLLBACK.

UNIT- IV (14 Hrs.)

PL/SQL - Introduction to PL/SQL, The Advantage of PL/SQL, PL/SQL Architecture,Fundamentals of PL/SQL, PL/SQL Data types, variables and constants, Assignments and expressions, Operator precedence, referencing Non-PL/SQL variables, built in functions, conditional and iterative control, SQL within PL/SQL, writing PL/SQL code. Cursor management in PL/SQL, Cursor manipulation, Triggers, Stored procedures, Exception handling in PL/SQL, Predefined exceptions, User defined exceptions, Triggers, Stored procedures.

Recommended Books

1. Bipin C. Desai, 'An Introduction to Database System', 3rd Edn., GalgotiaPublicationsPrivate Ltd, **2012**.
2. Ivan Bayross, 'SQL, PL/SQL The Programming Language of ORACLE', 2nd Edn., BPBPublication, **2003**.
3. Henry F. Korth, 'Database Systems Concepts', 5th Edn., McGraw Hill Inc, **2005**.
4. RamezElmasri and Shamkant B. Navathe, 'Fundamentals of Database Systems', 4th Edn., Pearson, **2003**.

OBJECT ORIENTED PROGRAMMING USING C++

Subject Code: MCAPS1-103 **LTPC 3104** **Duration: 60 Hrs.**

Course Objectives

After completion of this course, the students would be:

1. Able to learn basics and programming skills of high level language C++.
2. Able to learn how to manage the memory by using dynamic memory management.
3. Able to learn how to use reusability concept by using inheritance and templates.
4. Able to learn the skills of handing modular approach and exceptions.

UNIT-I (17 Hrs.)

Object-Oriented Programming Concepts - Need of Object-Oriented Programming - Comparison of procedural programming and ObjectOriented Programming - Characteristics of Object-Oriented Languages - C++ Programming Basics: Basic Program Construction - Data Types, Variables, Constants - Type Conversion, Operators, Library Functions - Loops and Decisions, Structures - Functions : Simple Functions, Passing arguments, Returning values, Reference Arguments. - Recursion, Inline Functions, Default Arguments - Storage Classes - Arrays , Strings

UNIT-II (15 Hrs.)

Features of Object Oriented Programming- Introduction to Classes and Objects Constructors and its types, Destructors - Passing Objects as Function arguments and Returning Objects from Functions - Operator Overloading Inheritance - Overloading Member Functions Pointers - Virtual Functions – Friend Functions, Static Functions.

UNIT-III (14 Hrs.)

Streams and Files- Streams: Classes and Errors, Disk File I/O with Streams - - Files: File Pointers - Error handling in File I/O - File I/O with member Functions - Overloading the extraction and Insertion Operators - Multi File Programs

UNIT-IV (14 Hrs.)

Templates and Exception-Templates: Function templates, Class templates - Exceptions: Need of Exceptions, keywords, Simple and Multiple Exceptions - Re-throwing Exception and Exception Specifications, Custom Exception, Introduction to Standard Template Library(STL)

Recommended Books

1. Robert Lafore, 'Object Oriented Programming in C++', 4th Edn., Waite Group, **2001**.
2. E. Balagurusamy, 'Object Oriented Programming with C++', 6th Edn., Tata McGraw Hill, **2013**.
3. R.S. Salaria, 'Object-Oriented Programming using C++', 4th Edn., Khanna BookPublishing, **2009**.
4. Bjarne Stroustrup, 'The C++ Programming Language', 3rd Edn., Addison Wesley, **1997**.
5. Herbert Schildt, 'C++: The Complete Reference', 4th Edn., McGraw Hill, **2009**.

COMPUTER ORGANIZATION & ARCHITECTURE

Subject Code: MCAPS1-104 **L T P C** **Duration: 45 Hrs.**

3003

Course Objectives

1. To provide students with a solid foundation in computer design.
2. To examine the operation of the major building blocks of a computer system.
3. To introduce students to the design and organization of modern digital computers & basic assembly language.

UNIT-I (12 Hrs.)

Basic Computer Organization and Design - Common Bus System, Registers, Instructioncodes, computer Instructions, Timing and Control, Instruction Cycle, Arithmetic, Logic & Shift micro operations instructions, Memory Reference Instructions, Design of Basic Computer and its working**.**

Programming & Controlling Basic Computer - Machine & Assembly Language,Programming Arithmetic and Logic Operations, Hardwired & Micro programmed control, Address Sequencing, Design of a control unit.

UNIT-II (10 Hrs.)

CPU Architecture - General register & stack organization, Instruction formats, AddressingModes, Data Transfer and Manipulation, Program Control, ALU & Control Unit Architecture.

I/O Organization - Peripheral Devices, input-output interface, Asynchronous Data Transfer,Modes of data transfer-programmed & interrupt initiated I/O, Priority Interrupt, DMA, I/O Processors.

UNIT-III (12 Hrs.)

Memory Organization - Main Memory-Memory Address Map, Memory connection toCPU, Associative Memory-Hardware organization, Cache Memory-Levels of Cache, Associative Mapping, Direct Mapping, Set-Associative Mapping.

Parallel & Multiprocessing Environment - Introduction to parallel processing, Pipelining,RISC Architecture, Vector & array processing, multiprocessing concepts, memory & resource Sharing, Inter processor communication & Synchronization.

UNIT- IV (11 Hrs.)

Overview of Assembly Language Programming - Architecture of a typical 8-bit processor(8085 microprocessor) - Registers, Instruction Set-Data Transfer Instructions, Arithmetic Instructions, Logical Instructions, Program Control Instructions, Machine Control Instructions.

Use of an Assembly Language for Specific Programs - Simple numeric manipulations,sorting of a list and use of I/O instructions.

Recommended Books

1. M. Morris Mano, 'Computer System Architecture', Prentice Hall, **1976**.
2. William Stallings, 'Computer Organization and Architecture', 9th Edn., Pearson, **2016**.
3. P.V.S. Rao, 'Computer System Architecture', 2nd Edn., PHI, **2009**.
4. John P. Hayes, 'Computer Architecture & Organization, 3rd Edn., McGraw Hill, **2012**.
5. Stone, 'Introduction to Computer Architecture', 2nd Edn., Galgotia, **1996**.

BUSINESS COMMUNICATIONS

Subject Code: MCAPS1-105 **L T P C** **Duration - 30 Hrs.**

2002

Course Objectives

1. This course is designed to give students a comprehensive view of communication, its scope and importance in business, the role of communication in establishing a favorable image of the organization.
2. The aim is to develop students' ability to communicate correctly and effectively on matters having relevance to day-to-day business operations.
3. This course will make student conversant with fundamentals of communication, help them honing oral, written and non-verbal communication skills and to transform their communication abilities.

UNIT- I (7 Hrs.)

Introduction to Communication - Meaning, Process, Importance of Communication inBusiness, Types of Information, Formal and Informal Communication, Internal and External Communication. Approaches to Effective Communication, Essentials of Effective Business Communication (7Cs model).

Written Communication - Advantages and Disadvantages, Covering letter, Need, Functionsand Kinds, Layout of Letter Writing, Types of Letter Writing: Persuasive Letters, Request Letters, Sales Letters, Complaints and Adjustments.

UNIT –II (7 Hrs.)

Developing Reading Skills - Identify the Purpose of Reading, Factors Effecting Reading,Course How to Think and Read, Developing Effective Reading Habits, Reading Tactics and Strategies: Training Eye and Training Mind (SQ3R)

Developing Listening Skills - Importance, Purpose of Listening, Art of Listening, FactorsAffecting Listening, Components of Effective Listening, Process of Listening, Principles and Barriers to Listening, Activities to Improve Listening

UNIT- III (8 Hrs.)

Oral Communication - Advantages and Disadvantages, Conversation as Communication,Art of Public Speaking, Group Communication Through Committees, Preparing and Holding
Meetings, Overcoming Stage Fright, Ambiguity Avoidance.

Departmental Communication - Meaning, Need and Types: Interview Letters, PromotionLetters, Resignation Letters, Newsletters, Circulars, Agenda, Notice, Office Memorandums, Office Orders, Press Release

Report Writing - Structure, Types, Formats, Drafting of Various Types of Report.Nonverbal – Features, Understanding of Body Language, Posture, Gestures. Influences on Communication: Social Influences, Culture and Communication, Few Guidelines for Better Multicultural Communication, Business Etiquettes and Communication.

UNIT- IV (8 Hrs.)

Group Discussion - Nature, Uses and Importance, Guidelines for GD Presentations: How toMake Effective Presentations, Four P‟ S of Presentation, Structuring, Rehearsing and Delivery Methods.

Resume Writing - Planning, Organizing Contents, Layout, Guidelines for Good Resume.Interviews: Preparation Techniques, Frequently Asked Questions about How to Face an Interview Board, Proper Body Posture, projecting a Positive Image, steps to Succeed in
Interviews, Practice Mock Interview in Classrooms.

The Case Method of Course - Dimensions of a Case, Case Discussion, Usefulness of TheCase Method, Training of Managers, Use The Case Method. Report Writing: Structure, Types, Formats, Preparations and Presentation.

Recommended Books

1. Lesikar, Petit &Flately, 'Lesikar's Basic Business Communication', Tata McGraw Hill.
2. Raman Meenakshi, 'Prakash Singh, Business Communication', Oxford University Press.
3. Rizvi Ashraf, 'Effective Technical Communication', Tata McGraw Hill.
4. Krizan, Buddy, 'Merrier, Effective Business Communication', Cengage Course.
5. Diwan & Aggarwal, 'Business Communication', Excel.
6. Baugh, Frayer & Thomas, 'How to write first class Business Correspondence', Viva Book
7. Taylor, 'English Conversion Practice', Tata McGraw Hill.
8. Devaraj, 'Executive Communication', Tata McGraw Hill.
9. Ober, 'Effective Bossiness Communication', Cengage Course.

SOFTWARE LAB. – I
(RELATIONAL DATABASE MANAGEMENT SYSTEM)

Subject Code: MCAPS1-106 **L T P C**
0042

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPS1-102. Students are required to do at least 8 assignments based on the paper.

SOFTWARE LAB – II
(OBJECT ORIENTED PROGRAMMING USING C++)

Subject Code: MCAPS1-107 **L T P C**
0042

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPS1-103.

BUSINESS COMMUNICATIONS AND SOFT SKILLS LAB.

Subject Code: MCAPS1-108 **L T P C**
0042

The students will have to perform the practicals in lab related to the syllabus of the subject "Business Communications" (MCAPS1-105).

DATA STRUCTURES

Subject Code: MCAPS1-201 **L T P C** **Duration: 60 Hrs.**
3 1 0 4

Course Objectives

1. A study of advanced programming topics focused on logical structures of data, their physical representation, design and analysis of algorithms operating on the structures, and techniques for program development and debugging.
2. Emphasis is placed on the appropriate use and choice of standard data structures.

UNIT-I (17 Hrs.)

Introduction to Data Structure - Concept of data, Problem analysis, Data structures andData structure operations, Notations, Mathematical notation and Functions, Algorithmic Complexity, Big-O Notation and time space trade off.

Arrays - Overview of Arrays, Recursion, Pointers, Pointer Arithmetic, Array of pointers,Arrays in terms of pointers, Static and Dynamic Memory Management, Garbage Collection, Understanding and Implementation of Various Data Structures with Applications.

Stack - Operations like Push, Pop and Various Applications like Conversion from Infix topostfix and prefix expressions, Evaluation of postfix expression using stacks.

Queues - Operations like Enqueue, Dequeue on Simple, Circular and Priority Queues.

Linked Lists - Operations like Creations, Insertion, Deletion, Retrieval and Traversal onSingle, Circular and doubly linked list.

UNIT-II (15 Hrs.)

Trees - Definitions and Concepts: Root Node, Leaf Node, Level, Degree, Height and Treerepresentation using linked List and array.

Tree Operations - Creation, Insertion, Deletion and Traversals (Preorder, In-order, Postordered) and searching on various types of trees. Types of Trees: Binary trees, Binary search tree, Height balanced (AVL) tree, B trees, B+ Tree.

Heap - Definition, Structure, Algorithms and applications.

UNIT-III (14 Hrs.)

Graphs - Graph definitions and Concepts: Edge, Vertices, and Graph representation using

Adjacency matrix, Adjacency lists. Types of graphs: Weighted, Unweighted, Directed, Undirected Graphs. Graph Operations: Creation, Insertion, Deletion, Traversals and Searching (Depth first, Breadth-first) of various types of graphs and Dijkstra's algorithm for shortest distance calculation.

UNIT- IV (14 Hrs.)

Sorting - Concepts, Order, Stability and Efficiency of various algorithms (Selection Sort,Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort and Radix Sort).

Searching - Concept and Efficiency of linear and binary search algorithms.

Hashing - Definition, Implementation and Applications.

Recommended Books

1. Seymour Lipschutz, 'Data Structures', 1st Edn., McGraw Hill Education, **2014.**
2. E. Horowitz, and S. Sahni, 'Fundamentals of Data Structures in C++', 2nd Edn., GalgotiaPublications Pvt. Ltd., **1999**.
3. A.V. Aho, Hopcroft, J.D. Ullman, 'Data Structures and Algorithms', 1st Edn., Pearson, **1983**.
4. Tanenbaum, 'Data Structures using C', 2nd Edn., Prentice Hall International, **2015**.

OPERATING SYSTEM

Subject Code: MCAPS1-202 **LTPC 3104** **Duration: 60 Hrs.**

Course Objectives

After completion of this course, the students would be able to:

1. Understand functions, Role, different structures and views of Operating system.
2. Understand Process management in operating system.
3. Understand Memory Management in operating system.
4. Understand Device Management in operating system.

UNIT-I (17 Hrs.)

Introduction - Introduction to Operating system, Role of Operating System as resourcemanager, function of kernel and shell, operating system structures, views of an operating system.

UNIT-II (14 Hrs.)

Process management - CPU scheduling, Scheduling Algorithms, PCB, Pricessynchronization, Deadlocks, Prevention, Detection and Recovery

UNIT-III (14 Hrs.)

Memory Management - Overlays, Memory management policies, Fragmentation and itstypes, Portioned memory managements, Paging, Segmentation, Ned of Virtual memories, Page replacement Algorithms, Concept of Thrashing

UNIT-IV (15 Hrs.)

Device Management - I/O system and secondary storage structure, Device managementpolicies, Role of I/O traffic controller, scheduler, File Management: File System Architecture, Layered Architecture, Physical and Logical File Systems, Protection and Security, Brief study to multiprocessor and distributed operating systems. Case Studies: LINUX / UNIX Operating System and Windows based operating systems. Recent trends in operating system.

Recommended Books

1. A. Silberschatz and Peter B. Galvin, 'Operating System Concepts', 2nd Edn., Wiley, **2013**.
2. Dhananjay M. Dhamdhere, 'Operating Systems', 1st Edn., McGraw Hill, **2008**.
3. Gary Nutt, 'Operating Systems Concepts', 2nd Edn., McGraw Hill, **2001**.
4. Stuart E. Madnick and John J. Donovan, 'Operating Systems', 1st Edn., McGraw Hill, **1974**.
5. William Stallings, 'Operating Systems: Internals and Design Principles', 6th Edn., PrenticeHall, **2008**.

DISCRETE MATHEMATICS

Subject Code: MCAPS1-203 **L T P C 3 0 0 3** **Duration: 45 Hrs.**

Course Objectives

1. To learn the ability to distinguish between the tractability and intractability of a given computational problem.
2. To be able to devise fast and practical algorithms for real-life problems using the algorithm design techniques and principles learned in this course.

UNIT-I (11 Hrs.)

Sets, Relations and Functions: Introduction, Combination of Sets, ordered pairs, proofs of general identities of sets, relations, operations on relations, properties of relations and functions, Hashing Functions, equivalence relations, compatibility relations, partial order relations.

Basic Logic: Propositional logic, Logical connectives, Truth tables, Normal forms (conjunctive and disjunctive), Validity of well-formed formula, Propositional inference rules (concepts of modus ponens and modus tollens), Predicate logic, Universal and existential quantification, Limitations of propositional and predicate logic.

UNIT-II (10 Hrs.)

Combinatorial Mathematics: Basic counting principles Permutations and combinations Inclusion and Exclusion Principle Recurrence relations, Generating Function, Application.

UNIT-III (12 Hrs.)

Probability Distributions: Probability, Bayes theorem, Discrete & Continuous probability distributions, Moment generating function, Probability generating function, Properties and applications of Binomial, Poisson and normal distributions.

Graph Theory: Graph- Directed and undirected, Eulerian chains and cycles, Hamiltonian chains and cycles Trees, Chromatic number Connectivity, Graph coloring, Plane and connected graphs, Isomorphism and Homomorphism. Applications.

UNIT-IV (12 Hrs.)

Monoids and Groups: Groups Semigroups and monoids Cyclic semigraphs and submonoids, Subgroups and Cosets. Congruence relations on semigroups. Morphisms. Normal subgroups. Dihedral groups.

Rings and Boolean Algebra: Rings, Subrings, morphism of rings ideals and quotient rings. Euclidean domains Integral domains and fields Boolean Algebra direct product morphisms Boolean sub-algebra Boolean Rings Application of Boolean algebra (Logic Implications, Logic Gates, Karnaugh map)

Recommended Books:

1. Lipschutz, 'Discrete Mathematics (Schaum Series)', 3rd Edn., McGraw Hill, **2009.**
2. Alan Doerr and Kenneth Levarseur, 'Applied Discrete Structures for Computer Science', Galgotia Publications, **2009.**
3. N. Ch SN Iyengar, V.M. Chandrasekaran, 'Discrete Mathematics', 1st Edn., Vikas Publication House, **2003.**
4. S. Santha, 'Discrete Mathematics and Graph Theory', 1st Edn., Cengage COURSE.
5. Kenneth H. Rosen, 'Discrete Mathematics and its Applications', 7th Edn., McGraw Hill, **2008.**
6. C.L. Liu, 'Elements of Discrete Mathematics', 4th Edn., McGraw Hill, **2012**.
7. Satinder Bal Gupta, 'Discrete Mathematics and Structures', 4th Edn., Laxmi Publications, **2008.**

SOFTWARE LAB. – III (DATA STRUCTURES)

Subject Code: MCAPS1-204 **L T P C**
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPS1-201.

SOFTWARE LAB. – IV (OPERATING SYSTEM)

Subject Code: MCAPS1-205 **L T P C**
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPS1-202. Students are required to do at least 8 assignments based on the paper.

DATA WAREHOUSING AND DATA MINING

Subject Code: MCAPD1-211 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives

After completion of this course, the students would be able to:

1. Understand operational database, data ware housing, need of database to meet industrial needs.

2. Identify the components in typical data warehouse Architecture and understand the multidimensional schemas for data warehouse.
3. Understand the knowledge about data mining, decision tree, generic algorithms and Fuzzy set approach.

UNIT – I (10 Hrs.)

Review of Data Warehouse- Need for strategic information, Decision support system,Knowledge discovery & decision making, need for data warehouse, Data warehousing and data mining, common characteristics of Data warehouse, Data Marts, Metadata, Operational versus analytical databases, trends and planning of Data warehousing.

UNIT - II (11 Hrs.)

Schemas and Architecture of Data warehouse- Multidimensional data model, Data cubes,Schemas for Multidimensional Database: stars, snowflakes and fact constellations. Data warehouse process & architecture, OLTP vs. OLAP, ROLAP vs. MOLAP, types of OLAP servers, 3-Tier data warehouse architecture, distributed and virtual data warehouses, data warehouse manager.

UNIT – III (12 Hrs.)

Introduction to Data Mining- Data mining definition & task, KDD versus Data mining,Techniques, Tools and Applications of Data mining. Data mining query languages, data specification, specifying knowledge, hierarchy specification, pattern presentation & visualization specification.

Data Mining Techniques- Association rules, Clustering techniques, Decision treeknowledge discovery through neural.

UNIT – IV (12 Hrs.)

Data Mining Classification- Networks & Genetic Algorithms, Rough Sets, Support VectorMachines and Fuzzy techniques. Mining Complex data objects, Spatial databases, Multimedia databases, Time series and Sequence data, mining Text Data bases and mining Word Wide Web.

Recommended Books:

1. Jiawei Han, Micheline Kamber, Jian Pei, 'Data Mining: Concepts and Techniques', 3rdEdn., Morgan Kaufmann, **2011**.
2. George M. Marakas, 'Modern Data Warehousing, Mining, and Visualization', 1stEdn., Prentice Hall, **2001**.
3. Elzbieta Malinowski and Esteban Zimanyi, 'Advanced Data Warehouse Design: From Conventional to Spatial and Temporal Applications (Data-Centric Systems and Applications)', 1stEdn., Springer, **2008.**
4. Matteo Golfarelliand Stefano Rizzi, 'Data Warehouse Design: Modern Principles and Methodologies', 1stEdn., McGra Hill Education, **2009.**
5. Alex Berson and Stephen J. Smith, 'Data Warehousing, Data Mining, & OLAP', 1stEdn., Tata McGraw Hill, **1997.**

BUSINESS INTELLIGENCE AND DIGITAL MARKETING

Subject Code: MCAPD1-212 **L T P C** **3 0 0 3** **Duration: 45 Hrs.**

Course Objectives

After completion of this course, the students would be able to:

1. Understand the role of business intelligence and digital marketing within an organization.
2. Use decision-making tools/Operations Research techniques and manage business processes using analytical and management tools.
3. Analyse and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

UNIT – I (12 Hrs.)

Introducing the Technical Architecture- The value of architecture, Technical Architectureoverview, Back room Architecture, Presentation Server Architecture, Front room Architecture, Infrastructure, Metadata, and Security.

Introducing Dimensional Modeling- Making the Case for Dimensional Modeling,Dimensional Modeling primer, Enterprise Data Warehouse Bus Architecture, More on Dimensions & Facts.

UNIT – II (10 Hrs.)

Designing the Dimensional Modeling- Modeling Process overview, Getting Organized,Four Step Modeling Process, Design the Dimensional Model.

UNIT – III (11 Hrs.)

Introducing Extract, Transformation & Load- Round up the requirements, the 34subsystems of ETL, Extracting Data, Cleaning & Conforming data.

Introducing Business Intelligence Applications- Importance of B.I., Applications,Analytical cycle for B.I., Types of B.I. Applications, Navigating Applications via the B.I. portal.

UNIT – IV (12 Hrs.)

Designing & Developing B.I. Applications- B.I. Application resource planning, B.I.Application Specification, B.I. Application Development, B.I. Application maintenance.

Recommended Books

1. Sam Anahory and Dennis Murray, 'Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems', 1st Edn., Addison Wesley Longman Ltd., **1997**.
2. Ralph Kimball and Margy Ross, 'The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modelling', 3rd Edn., Wiley, **2013**.
3. Micheline Kamber, Jian Pei, 'Data Mining: Concepts and Techniques', 3rd Edn., Morgan Kaufmann, **2011**.
4. R.N. Prasad and Seema Acharya, 'Fundamentals of Business Analytics', 1st Edn., Wiley, **2011**.

SOFTWARE TESTING AND QUALITY ASSURANCE

Subject Code: MCAPD1-213 **L T P C** **3 0 0 3** **Duration: 45 Hrs.**

Course Objectives

After completion of this course, the students would be able to:

1. Analyse different approaches to software testing and quality assurance, and select optimal solutions for different situations and projects;
2. Conduct independent research in software testing and quality assurance and apply that knowledge in their future research and practice;
3. Evaluate the work of peers constructively by following proven methods of peer-review, and by using the principles of research ethics.

UNIT-I (10 Hrs.)

Testing Principles- Need of testing, Basic concepts–errors, faults, defects, failures, test bed, unit testing, integration testing system, system testing, regression testing, alpha, beta and acceptance testing, functional testing, performance testing, white box testing, black box testing, verification and validation.

UNIT-II (12 Hrs.)

Test Management- Testing Life Cycle–Roles and activities, Test Planning, Develop test plan review, Test Cases design strategies. Black box approach: random testing, equivalence class partitioning and boundary value analysis. White box approach: test adequacy criteria, coverage and control flow graphs, paths, loop testing, mutation testing.

UNIT-III (12 Hrs.)

Software Metrics- Scope of software metrics, Classifying software measures, Measurement basics – representational theory, scales, meaningfulness, What to measure–GOM technique, Control flow structure, product quality metrics – MTTF, defect density,
customer problems, customer satisfaction, function point.

Quality Assurance- Quality concepts–quality, quality control, quality assurance, cost ofquality Software quality assurance – SQA activities, software reviews, inspections, audits, Software reviews, inspections,

audits, Software reliability Quality Attributes: correctness, reliability, usability, integrity, portability, maintainability, interoperability. Ishikawa's Seven Basic Tools.

UNIT-IV (11 Hrs.)

Quality Standards- Basic concept of–ISO 9000 & 9001, CMM, six sigmas.

Development of CMM- CMM–Following KPAs: requirements management (RM),software project tracking and oversight (SPTO), software configuration management (SCM), organization process definition (OPD), software product engineering (SPE), peer reviews (PR), quantitative process management (QPM), process change management.

Recommended Books:

1. Kshirasagar Naik and PriyadarshiTripathy, 'Software Testing and Quality Assurance:Theory and Practice', 1st Edn., Wiley, **2008**.
2. Jeff Tian, 'Software Quality Engineering: Testing, Quality Assurance, and Quantifiable, Improvement', 1st Edn., Wiley, **2005**.
3. William E. Perry, 'Effective Methods for Software Testing: Includes Complete Guidelines, and Checklists', 3rd Edn., Wiley, **2006**.
4. Glenford J. Myers, 'The Art Of Software Testing', 3rd Edn., Wiley, **2015**.

PROGRAMMING IN JAVA

Subject Code: MCAPD1-221 **LTPC 3003** **Duration: 45 Hrs.**

Course Objectives

At the end of the course, the students should be able to:

1. Use the Java programming language in the development of small application programs that demonstrate professionally acceptable coding and performance standards.
2. Understanding of the basic principles of the object oriented development process and apply this understanding to the analysis and design of solutions for small scale problems.
3. Work with the JDBC technology and learn Java Generics and the development of Projects.

UNIT–I (11 Hrs.)

Introduction- Object Oriented Concept, Features and Applications of Java, Differencesbetween Java and C++, Structure of Java Program, Literals, Tokens, Keywords, Constants, Variables & Data types, Scope of variables, Operators, Expressions, Flow control statements. Arrays, Vectors, Type Conversion, Command Line Arguments, Access specifiers, Constructors, Inheritance, Static Classes, Abstract Classes, Final Classes, Wrapper Classes, Garbage Collection & Finalize method, Handling String and String Buffer classes, Method Overloading and Overriding.

UNIT–II (11 Hrs.)

Interfaces & Packages- Introduction, implementing multiple inheritance through Interfaces,Packages, Multithreaded Programming.

Exception Handling- Introduction, Handling System defined Exceptions, Creating andhandling user defined exceptions.

Managing I/O- Introduction to streams, Handling and using various Stream Classes.

UNIT–III (11 Hrs.)

Applets- Introduction to Applets, Types of Applets, Using Applet Applications, PassingParameters to Applets.

Introduction to Graphic Programming- Applying 2-D transformations on Objects, EventHandling, Layouts, Frames, Panels, JDBC.

UNIT–IV (12 Hrs.)

Advanced Programming- Servlet Programming (Servlet Life Cycle, Generic Servlet,HttpServlet, HttpServletRequest, HttpServletResponse, Service method, doGET method, doPOST method, Servlet Exception).

Recommended Books

1. Y. Daniel Liang, 'Introduction to Java Programming', 9th Edn., Pearson, **2011.**

2. HerbetSchildt, 'Java 2: The Complete Reference', 5th Edn., McGraw Hill, **2002.**
3. Gary Cornell and Cay S. Horstmann, 'Core Java, Volume 2- Advanced Features', 8th Edn., Pearson, **2008.**
4. Ed Roman, Rima Patel and Gerald Brose, 'Mastering Enterprise Java Beans', 3rd Edn., JohnWiley& Sons Inc., **2004.**

PROGRAMMING WITH PYTHON

Subject Code: MCAPD1-223 **LTPC 3003** **Duration: 45 Hrs.**

Course Objectives

At the end of the course, the students should be able to:

1. Master the fundamentals of writing Python scripts and Learn core Python scripting elements such as variables and flow control structures.
2. Discover how to work with lists and sequence data
3. Write Python functions to facilitate code reuse
4. Use Python to read and write files and Work with the Python standard library

UNIT-I (11 Hrs.)

Introduction to Python: Installing Python, Simple program using Python, Expressions and Values, Variables and Computer Memory, error detection, Multiple line statements, Designing and using functions, functions provided by Python, Tracing function calls in memory model, omitting return statement. Working with Text: Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, Printing Information, Getting Information from the Keyboard.

UNIT- II (11Hrs.)

A Boolean Type: A Boolean Type, Choosing Statements to Execute, Nested If Statements, Remembering the Results of a Boolean Expression Evaluation, A Modular Approach to Program Organization, Importing Modules, Defining Your Own Modules, Testing Code Semi automatically Grouping Functions Using Methods: Modules, Classes, and Methods, Calling Methods the Object-Oriented Way, Exploring String Methods, Underscores.

UNIT- III (12Hrs.)

Storing Collections of Data Using Lists: Storing and Accessing Data in Lists, modifying Lists, Operations on Lists, Slicing Lists, Aliasing, List Methods, Working with a List of Lists. Repeating Code Using Loops: Processing Items in a List, Processing Characters in Strings, Looping Over a Range of Numbers, Processing Lists Using Indices, Nesting Loops in Loops, Looping Until a Condition Is Reached, Repetition Based on User Input, Controlling Loops UsingBreak and Continue Reading and Writing.

UNIT- IV (11Hrs.)

File Operation: Reading config files in python Writing log files in python Understanding read functions, read (), read line () and read lines () Understanding write functions, write () and writelines () Manipulating file pointer using seek Programming using file operations.

Recommended Books:

1. Downey, Allen B. Think Python: How to Think Like a Computer Scientist (Version 1.6.6 Ed.),**2012**.
2. Hamilton, Naomi. "The A-Z of Programming Languages: Python",**2008**.
3. Lutz, Mark Learning Python (5th ed.). O'Reilly Media,**2013**.
4. Pilgrim, Mark Dive into Python 3. Apress,**2009**.

SOFTWARE LAB. – V
(PROGRAMMING IN JAVA)

Subject Code: MCAPD1-222 **LTPC**
0042

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-221.

SOFTWARE LAB. – VI
(PROGRAMMING WITH PYTHON)

Subject Code: MCAPD1-224 **LTPC**
0042

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-223.

SOFTWARE ENGINEERING

Subject Code: MCAPS1-001 **L T P C** **Duration: 60 Hrs.**
3 1 0 4

Course Objectives

1. To apply principles of software development and evolution.
2. To specify, abstract, verify, validate, plan, develop and manage large software and learn emerging trends in software engineering.

UNIT-I (17 Hrs.)

Introduction to Software- Definition, Software characteristics, Software components, Software Applications.
Introduction to Software Engineering- Definition, Software Engineering Paradigms, Waterfall Model, Prototyping Model, Interactive Enhancement Model, the Spiral Model.

UNIT- II (15Hrs.)

Software Metrics- Role of Metrics and Measurement, Metrics for software productivity and quality, Measurement software, size–oriented metrics, function oriented metrics, Metrics for software quality.
Software Requirement Specification (SRS)- Problem analysis, structuring information, Data flow diagram and data dictionary, structured analysis, Characteristics and component of (SRS).

UNIT- III (14Hrs.)

Planning a Software Project- Cost estimation, uncertainties in cost estimation, Single variable model, COCOMO model, Project scheduling and milestones, Software & Personal Planning, Verification & Validation (V & V), inspection & review.
System Design- Design Objectives, Design Principles, problem, Partitioning, Abstraction, Top Down and Bottom–up techniques, Structure Design, Structure Charts, Design Methodology.

UNIT- IV (14Hrs.)

Coding- Coding by Top–down and Bottom–up, Structured Programming, Information Hiding, Programming style, Internal Documentation.

Testing- Level of testing, Test cases and test criteria, Functional Testing, Structural Testing.

Recommended Books

1. Roger S. Pressman, 'Software Engineering – A Practitioner's Approach ', 6th Edn., McGraw Hill,**2010**.
2. R.E. Fairley, 'Software Engineering Concepts', Paperback Edn., McGraw Hill,**2004**.
3. Jalota P., 'An Integrated Approach to Software Engineering', 3rd Edn., Narosa Publishing House,**2016**.

DIGITAL ELECTRONICS

Subject Code: MCAPS1-002 **LTPC** **Duration: 60 Hrs.**
3104

Course Objectives

1. Digital circuits which are the basic building blocks of a computer are introduced in this module to let the students know what activities it does behind the computing environment.
2. This course portrays excellent ideas of the logic gates available and data processing to make students understand the concept better with the analog and digital signals while computing.

UNIT-I (17 Hrs.)

Number System - Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, Signed and Unsigned number, Conversion from One Number System to another. Arithmetic Operation without Changing the Base, Floating Point Representation.
Binary Codes - Weighted Binary Codes, Non Weighted Codes, Reflective Codes, Sequential Codes, Alphanumeric Codes, BCD Code, Code Conversions, BCD Arithmetic.
Logic Gates - Introduction to Logic gates, Universal Gates, Logic Gates Applications.

UNIT-II (15 Hrs.)

Boolean Algebra - Introduction, Boolean Laws-Commutative Law, Associative Law, Distributive Law, AND Laws, OR Laws, Inversion Laws, Principle of Duality, Duality Theorem, De-Morgan's Theorem. Simplification of Boolean Expression using Boolean algebra, Sum of Products (SOP) & Product of Sums (POS) Forms, Realization of Boolean Expression using Gates, K-Maps, Simplification of Boolean Expression using K-Maps.
Combinational Logic Circuits - Half Adder & Half Subtractor, Full Adder &Full Subtractor, Parallel Binary Adder, Binary Adder/Subtractor, BCD Adder, BCD Subtractor. Multiplexers & Demultiplexers, Implementation of Boolean equations using Multiplexer and Demultiplexer, Encoders & Decoder.

UNIT-III (14 Hrs.)

Sequential Logic Circuits - Latch, Flip Flops- R-S Flip-Flop, J-K Flip-Flop, Master-Slave J-K Flip-Flop, Race Condition, Removing Race Condition, D Flip-Flop, T Flip-Flop, Applications of Flip-Flops, Registers.

Counters - Design of Asynchronous Counters, Design of Synchronous Counters.

Logic Families - RTL, DCTL, DTL, TTL, ECL and its various Types, Comparison of LogicFamilies.

UNIT-IV (14 Hrs.)

Memory Devices - Classification of memories, RAM organization, Write operation, Readoperation, Memory cycle. Static RAM Cell-Bipolar, RAM cell, MOSFET RAM cell, Dynamic RAM cell. ROM Organization, PROM, EPROM, EEPROM, Field Programmable Gate Arrays (FPGA).

Signal Conversions - Analog & Digital signals, A/D and D/A conversion.

VLSI Design - Introduction, Process & Applications.

Recommended Books

1. Thomas C. Bartee, 'Digital Computer Fundamentals', 6th Edn., McGraw Hill, **1984**.
2. R.P. Jain, 'Modern Digital Electronics', 4th Edn., Tata McGraw Hill, **2009**.
3. M. Morris Mano, 'Digital Logic and Computer Design', 1st Edn., Pearson, **2004**.
4. William H. Gothmann, 'Digital Electronics: An Introduction to Theory and Practice', 2nd Edn., Prentice Hall, **1982**.
5. Albert Malvino, 'Digital Principles and Applications', 5th Edn., Tata McGraw Hill, **1994**.

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Subject Code: MCAPS1-003 **L T P C** **3 1 0 4** **Duration: 60 Hrs.**

Course Objectives

1. To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
2. To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

UNIT-I (14 Hrs.)

Mathematical Logic - Statements, logical operations, tautologies, contradictions, logical implications and equivalence, normal forms, theory and Inference for statement calculus, predicate calculus, Inference theory for predicate calculus.

UNIT- II (14 Hrs.)

Relations and Functions - Binary relations, computer representation of relations and diagraph, Equivalence relations, applications of congruence, Composition of relations, Transitive Closure, partially ordered sets, Hasse diagrams, lexicographic ordering, topological sorting, Lattices and special types of lattices, Types of functions, functions for computer sciences, growth of function and binary operations.

UNIT-III (17 Hrs.)

Permutations and Combinations - Basic concepts; Rules of counting, combinatorial distribution of distinct and non-distinct objects, generating functions for permutation and combinatorial enumeration.

Recursion and Recurrence Relation - Primitive recursive function, Polynomials and their recursion, Iteration, Sequence and discrete functions, Recurrence relations, Generating function.

UNIT-IV (15 Hrs.)

Trees and Graphs - Lattice and Algebraic System, Basic Properties of Algebraic Systems, Special Types of Lattices, Distributed, Complemented Lattices, Boolean Algebra, Boolean Expressions, Normal Form of Boolean Expressions, Boolean Function, Basic Circuits and Theorems, Logical Gates and Relations of Boolean Function, Introduction to Graphs, Graph Terminology, Graph Isomorphism, Directed and Undirected Graphs and Their Representations; Paths, Reachability and Connectedness; Basic Concepts of Trees And Spanning Tree.

Recommended Books

1. J.P. Tremblay, 'Discrete Mathematical Structures', Tata McGraw Hill, **1987**.
2. Kenneth H. Rosen, 'Discrete Mathematics and its applications', 7th Edn., Tata McGrawHill, **2012**.
3. Ralph P. Grimaldi, 'Discrete and Combinatorial Mathematics', Pearson Education, **2002**.
4. Alan Doerr, 'Applied Discrete Structures for Computer Science', Galgotia Publications, **1991**.
5. C.L. Liu, 'Elements of Discrete Mathematics', 2nd Edn., Tata McGraw Hill, **1985**.

ARTIFICIAL INTELLIGENCE

Subject Code:MCAPS1-301 **LTPC** **Duration: 60 Hrs.**

3104

Course Objectives

After completion of this course the student will be able to understand the:

1. Different types of AI agents.
2. Various AI search algorithms.
3. The fundamentals of knowledge representation.

UNIT–I (17 Hrs.)

Basics of AI - What is Artificial Intelligence, what is an AI technique, Criteria for success, Problems, Problem spaces and search, Production system, Problem characteristics, Hill-climbing, Best-First search, AO algorithm, Constraint satisfaction.

UNIT–II (15 Hrs.)

Natural Language Processing - Introduction, Overview of linguistics, Grammars and language, Basic Parsing techniques, Semantic analysis and representation, Structure, Natural Language generation, Natural Language systems.

UNIT–III (14 Hrs.)

Knowledge Representation - Issues, Approaches to knowledge Representation, Representing simple facts in logic, Computable functions and predicates, Procedural vs declarative knowledge, Forward vs Backward Reasoning matching, Control knowledge.

UNIT–IV (14 Hrs.)

Expert Systems - Rule-Based system architecture, Non-production system Architecture, dealing with uncertainty, Knowledge acquisition and validation, Knowledge system Building tools.

Recommended Books

1. Elaine Rich and Kevin Knight, 'Artificial Intelligence', 5th Edn., Tata McGraw Hill, **2014**.
2. Dan. W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', 1st Edn., Prentice Hall India, **2015**.
3. Eugene Charniak and Drew McDermott, 'Introduction to Artificial Intelligence', 1st Edn., Pearson Education, **2002**.

DESIGN AND ANALYSIS OF ALGORITHMS

Subject Code: MCAPS1-302 **LTPC** **Duration: 60 Hrs.**

3104

Course Objectives

After completion of this course, the students would be able to:

1. Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
2. Ability to apply and implement learned algorithm design techniques and data structures to solve problems.
3. Differentiate between various algorithms for sorting, searching, and selection and know the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems.
4. Analysis of Geometric algorithms (range searching, convex hulls, segment intersections, closest pairs) Know various Text pattern matching, tries, KMP Algorithm.

UNIT-I (17 Hrs.)

Introduction - Algorithms and its Properties, Time and space complexity of an algorithm. Comparing the performance of different algorithms for the same problem. Different orders of growth. Asymptotic notation. Polynomial vs. Exponential running time.

Basic Algorithm Design Techniques- Divide-and-conquer, greedy, Backtracking, Branch and Bound, dynamic programming and randomization. Overall technique with example, problems and algorithms illustrating the use of these techniques.

UNIT-II (15 Hrs.)

Graph Algorithms- Graph traversal: breadth-first search (BFS) and depth-first search (DFS). Applications of BFS and DFS. Topological sort. Shortest paths in graphs: Dijkstra and Bellman-Ford (Single source shortest path, And All pair shortest path (Floyd Warshal algorithm). Minimum spanning Trees: Prim's and Kruskal Algorithm.

UNIT-III (14 Hrs.)

Sorting and Searching- Binary search in an ordered array. Sorting algorithms such as Merge sort, Quick sort, Heap sort, Radix Sort, and Bubble sort with analysis of their running times. Lower bound on sorting, searching and Merging, Median and order statistics.

NP-Completeness- Definition of class P, NP. NP-hard and NP-complete problems. 3SAT is NP-complete. Proving a problem to be NP-complete using polynomial-time reductions. Examples of NP-complete problems. Approximation algorithms for various NP-complete problems: TSP, Hamiltonian Cycle, Knapsack.

UNIT-IV (14 Hrs.)

Advanced Topics- Pattern matching algorithms: Knuth-Morris-Pratt algorithm, Brute Force. Algorithms in Computational Geometry: Convex hulls: Jarvin March and Graham Scan. Integer and polynomial arithmetic. Matrix multiplication: Strassen's algorithm..

Recommended Books

1. J. Kleinberg and E. Tardos, 'Algorithm Design', 1st Edn., Pearson Publications, **2005**.
2. H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, 3rd Edn., The MIT Press Ltd, **2009.**
3. S. Dasgupta, C.H. Papadimitriou, and U.V. Vazirani, 'Algorithms', McGraw Hill Education, **2006.**
4. Michael T. Goodrich and Roberto Tamassia, 'Algorithm Design: Foundations, Analysis, and Internet Examples', 1st Edn., Wiley India Pvt Ltd, **2006**.

INFORMATION AND NETWORK SECURITY

Subject Code: MCAPS1-303 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives

After completion of this course, the students would be able to:

1. Identify common network security vulnerabilities and attacks and explain the foundations of Cryptography and network security.
2. Impart knowledge on Encryption techniques, Design Principles and Modes of operation.
3. Be familiar with Firewall Design Principles and network security designs using available secure solutions.

UNIT-I (10 Hrs.)

Introduction - Security Attacks (Passive & Active Attacks), Security Services, Security Mechanisms, Model for Internetwork Security, Man in the middle attack, Conventional
Encryption Principles, Monoalphabetic ciphers, Playfair Ciphers, Transposition Ciphers, Cipher block chaining mode, Approaches of message authentication.

UNIT-II (11 Hrs.)

Public Key Cryptography - Public Key Cryptography Principles, RSA algorithm, Digital Signatures, Digital Certificates, Certificate Authority and Key management Kerberos, X.509 Directory Authentication Service.

UNIT-III (12 Hrs.)

IP Security - Security Problems of IP, Security Objectives, IP Security Protocol Modes, Authentication Header, Security Payload. Firewall Characteristics, Types of Firewalls and their practical use, NAT.

UNIT-IV (12 Hrs.)

Email and Web Security - PGP, S/MIME, Security Socket Layer, Transport Layer Security, Secure Electronic Transaction.

Recommended Books:

1. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, 'Handbook of Applied Cryptography', Jaypee Medical, **1996**.
2. Bart Preneel, Christof Paarand Jan Pelzl, 'Understanding Cryptography', 1st Edn., Springer, **2010**.
3. Bernard Menezes, 'Network Security and Cryptography', 1st Edn., Cengage, **2010**.
4. William Stallings, 'Network Security Essentials Applications and Standards', 5th Edn., Pearson, **2013**.

SOFTWARE LAB. – VII
(DESIGN AND ANALYSIS OF ALGORITHMS)

Subject Code: MCAPS1-304 **L T P C**
0042

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPS1-302.

LAMP TECHNOLOGIES

Subject Code: MCAPD1-311 **L T P C** **Duration: 45 Hrs.**
3003

Course Objectives

After completion of this course, the students would be able to;

1. Understand brief introduction to the open source technologies.
2. Understand interactive sessions enabling students to enhance their skills in contributing and implementing their technical knowledge.

UNIT-I (10 Hrs.)

Introduction - Open Source definition, Free Software vs. Open Source Software, PublicDomain Software, Open Source history, Initiatives, Principle and Methodologies, Open Standards.

Open Source Development Model Licenses and Patents - What Is a License, ImportantFOSS Licenses (Apache, BSD, GPL, LGPL), Copyrights and Copy lefts, Patents Economics of FOSS: Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization.

UNIT-II (12 Hrs.)

Programming on PHP and JavaScript - JavaScript: JavaScript variables, control structures,functions, arrays and objects. Cascading Style Sheets, Client Side Scripting - Java Script, PHP: Form processing and business logic, stream processing and regular expressions, viewing client/server environment variables, connecting to database and handling of cookies. SQL, Accessing databases with PHP.

UNIT-III (11 Hrs.)

Open Source Web Technologies - Two Tier and Three Tier Web based Application Architecture. Apache, Web server conceptual working, Installation and Configuration, httpd.conf file, Logging, Security, Running a website, MySQL, ER diagram, Relational database, Installation, Configuration, Administration, Common SQL queries, PHP, Dynamic
content, Server side scripting, Installation, Configuration, Administration, Language syntax, Built-in functions, PHP and MySQL connectivity.

UNIT- IV (12 Hrs.)

Open Source Ethics -Open source vs. closed source Open source government, Open sourceethics. Social and Financial impacts of open source technology, shared software, Shared source.

Programming on XHTML and XML - Editing XHTML, W3C XHTML validationservices, designing XHTML by using XHTML tables, frames, forms and other elements. CSS and its types. XML, XML namespaces, DTD, XML schema, XML vocabularies, DOM and its methods, SOAP.

Recommended Books

1. B. Ware, B Lee J., 'Open Source Development with Lamp: Using Linux, Apache, MySQL, Perl, and PHP', 1st Edn., Addison Wesley Professional, **2003**.
2. E. Rosebrock, E. Filson, 'Setting Up LAMP – Getting Linux, Apache, MySQL, and PHP Working Together', 1st Edn., SYBEX Inc., **2004**.
3. Deitel, 'Internet and World Wide Web, How to Program', 4th Edn., Prentice Hall, **2008**.

DATABASE ADMINISTRATION

Subject Code: MCAPD1-313 **L T P C** **Duration: 45 Hrs.**
3003

Course Objectives

After completion of this course, the students would be able to:

1. Learn install and configure various database packages. The student will also learn various database objects like tables, views and indexes.
2. Learn various database tasks like data migration, Importing and Exporting data.
3. Learn to create user accounts, grant privileges and implement database encryption.
4. Learn Database backup and recovery and perform database tuning and optimization.

UNIT-I (12 Hrs.)

Introduction - Understanding role and responsibilities of DBA, Database Environment management (network, CPU, disk and RAM), Installing and upgrading various database packages (MS SQL Server, Oracle, MySQL), Comparing various database packages, configuring various services and components, Understanding the client/server model, Communication protocols, Database instance management, Creating and managing various database objects (tables, views, indexes).

UNIT-II (12 Hrs.)

Managing Database Servers - Understating client tools for administrative tasks, Task Automation, implementing migration, consolidation and upgrade strategy, Hardware resource allocation, Business policy implementation, Monitoring and trouble-shooting, implementing database compression, Database Replication and multiple servers, Exporting and Importing data, Managing Data integrity.

UNIT-III (10 Hrs.)

Security and Availability - Understanding User Access and Security, Creating and modifying user accounts, Creating, Modifying and Using roles, Granting and Revoking Privileges, querying role information, Database backup, restoration and recovery, Types of failure, defining a backup and recovery strategy, Testing the backup and recovery plan, RAID implementation.

UNIT-IV (11 Hrs.)

Performance Tuning - Introduction to performance tuning and its requirement, performance tuning methodology, Monitoring status variables that affect performance, General Table
Optimizations, using indexes to improve performance, Monitoring and optimizing the performance of the database, identifying full-table scans, Re-writing SQL queries, tuning sub-queries, Database mirroring, clustering.

Recommended Books

1. Adam Jorgensen, Jorge Segarra, Patrick Leblanc, Jose Chinchilla and Aaron Nelson, 'Microsoft SQL Server 2012 Bible', Wiley India Pvt Ltd, **2012**.
2. Ken Simmons and Sylvester Carstarphen, 'Pro SQL Server 2012 Administration', 2nd Edn., Dreamtech Press, **2012**.
3. Sam R. Alapati, 'Expert Oracle Database 11g Administration', Dreamtech Press, **2009**.
4. Sheeri K. Cabral and Keith Murphy, 'MySQL Administrator's Bible', John Wiley & Sons, **2009**.

CLOUD COMPUTING

Subject Code: MCAPD1-315 **LTPC** **Duration: 45 Hrs.**

3003

Course Objectives

1. To understand the basic concepts Cloud Computing.
2. To understand the taxonomy and types of Cloud Computing.
3. To understand different hypervisors of Clouds for the Virtualization.

UNIT-I (10 Hrs.)

Evolution of Cloud Computing - Vision of Cloud Computing, Definition, Deployment models, Reference models, Benefits and Challenges to Cloud Computing, already using Cloud Computing; Electronic Faxing, Voice in the Cloud, Commerce in the Cloud, Distributed Hosting in the Cloud, Accounting and Online Banking in the Cloud, Cloud Computing Applications.

UNIT-II (10 Hrs.)

Cloud Service Providers and Cloud Vendor's - IaaS Providers, PaaS Providers, SaaSProviders, Specialized Cloud Software Providers. Cloud Vendor's IBM, Amazon AWS, HP, Oracle.

UNIT-III (13 Hrs.)

Securing the Cloud- Reliability, Availability and Security: FUDD Factor, DoS Attack, Trust, Standard and Vendor Selection, SAS70 and Cloud Computing, Cloud Security Alliance, SysTrust Certification, Cloud Audit.

UNIT-IV (12 Hrs.)

Demystifying the Cloud- A Case Study using Amazon's Cloud Service, Using Amazon's S3Functionality, moving a Simple Application to the Cloud; Step1, Move Static Content to S3, Step 2; Move Web Servers and Backend, Moving the database, Eucalyptus, Nimbula.

Recommended Books

1. Rajkumar Buyaa, James Broberg, Andrzej Goscinski, 'Cloud Computing Principles and Paradigms' 1st Edn., Wiley, **2011.**
2. David E.Y. Sarna, 'Implementing and Developing Cloud Computing Applications', 1st Edn., CRC Press, **2011**.
3. Chris Wolf, Erick M. Halter, Virtualization: From the Desktop to the Enterprise, 1st Edn., A Press, **2005**.
4. George Reese, 'Cloud Application Architectures: Building Applications and Infrastructure in the Cloud', 1st Edn., O'Reilly Publishers, **2009**.

SOFTWARE LAB.-VIII (LAMP TECHNOLOGIES)

Subject Code: MCAPD1-312 **L T P C**

0042

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-311.

SOFTWARE LAB.-IX (DATABASE ADMINISTRATION)

Subject Code: MCAPD1-314 **L T P C**
0042

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-313.

SOFTWARE LAB. - X (CLOUD COMPUTING)

Subject Code: MCAPD1-316 **L T P C**
0042

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-315.

THEORY OF COMPUTATION

Subject Code: MCAPS1-401 **LTPC** **Duration: 60 Hrs.**
3104

Course Objectives

After completion of this course, the students would be able to:

1. Design a finite automaton to recognize a given regular language and transform a language into regular expression or finite automaton or transition graph.
2. Define deterministic and nondeterministic finite automata and prove properties of regular languages and their classification.
3. Build a context-free grammar for pushdown automata.
4. Design Turing machine and Post machine for a given language.

UNIT-I (17 Hrs.)

Finite Automata - Formal language, need for formal computational models, Noncomputational models, Deterministic finite Automata, Non deterministic finite Automata, Equivalence of NFA and DFA, 2-Way Finite Automata, Crossing sequences, Moore and Mealy Machine, Application of finite automata i.e. Lexical Analyzers, text editors.

UNIT-II (14 Hrs.)

Regular Expression and Languages - Regular expression, Equivalence of finite Automata and Regular expressions, Conversion between regular expressions and finite Automata, Application of Regular Expressions, Lexical analysis, Finding pattern in text.

UNIT-III (14 Hrs.)

Regular Languages and Regular Sets - Pumping lemma for regular sets, Applications of pumping lemma. Closure properties of regular language, The Myhill-Nerode Theorem, Minimization of finite Automata.

Pushdown Automata - Pushdown Automata, Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context free grammar.

UNIT-IV (15 Hrs.)

Context Free Grammar and Languages - Context free Grammars, Derivation Trees, Leftmost and rightmost derivations, Ambiguity, Parsing techniques for parsing of general CFG's, Properties of Context free Languages, Normal forms for context free grammars, The Pumping Lemna for context free Languages, Closure properties of context free languages.

Turing Machine (TM) - One Tape, multi-tape, The notions of time and space complexity interms of T.M. Construction of simple problems, Computational complexity.

Recommended Books

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, 'Introduction to Automata Theory, Languages and Computation', 3rdEdn., Pearson, **2006**.
2. Daniel I.A. Cohen, 'Introduction to Computer Theory', 2ndEdn., Wiley, **2011**.
3. Adesh K. Pandey, 'Theory of Automata and Computation', S.K. Kataria& Sons, **2013**.
4. K.L.P. Mishra, 'Theory of Computer Science: Automata, Languages and Computation', 3rdEdn., Prentice Hall India Course Private Limited, **2006**.

CURRENT TRENDS AND TECHNOLOGIES

Subject Code: MCAPS1-402 **L T P C** **Duration: 45 Hrs.**
3003

Course Objectives

After completion of this course, the students would be able to

1. Recognize the concepts of emerging technologies.
2. Analyze the components of cloud computing.
3. Critically analyse case studies to derive the best practice model to apply when developing and deploying parallel, distributed, cloud and IoT based applications.

UNIT–I (10 Hrs.)

Introduction to Computing-Emerging Trends in Computing like Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Utility Computing, Cloud Computing, High Performance Computing, Autonomic Computing.

UNIT–II (11 Hrs.)

Cloud Computing-Introduction, Cloud Types, Uses of Cloud, Components of Cloud Computing - Software as a Service, Platform as a Service, Infrastructure as a Service, Virtualization in Cloud Computing, Concept of Green Clouds.

UNIT–III (12 Hrs.)

Soft Computing-Soft Computing VS Hard Computing; Introduction to Neural Networks–Intelligence, Neurons, Artificial Neural Networks, Application Scope of Neural Network, Brain VS Computer.

UNIT–IV (12 Hrs.)

IoT and Fog Computing-Topologies, Edge Routers, Client-Server Architecture, P2P, M2M,Introduction to Fog Computing, Benefits of Fog Computing.

Recommended Books

1. Joshy Joseph, Craig Fellenstein, 'Grid Computing', 1st Edn., Prentice Hall Professional, **2004**.
2. Rajkumar Buyaa, James Broberg, Andrzej Goscinski, 'Cloud Computing Principles and Paradigms', 1st Edn., Wiley, **2011.**
3. Tettamanzi, Andrea, Tomassini and Macro, 'Soft Computing', Springer, **2001**.
4. Rajkumar Buyaa, Vecchiola, Selvi, 'Mastering Cloud Computing', 1st Edn., McGraw Hill, **2013**.
5. ArshdeepBahga, Vijay Madisetti, 'Internet of Things (A Hands -on- Approach)', 1st Edn., VPT, **2014**.

SOFTWARE PROJECT (IMPLEMENTATION AND EXECUTION)

Subject Code: MCAPS1-403 **L T P C**
0063

The Implementation of the Project is based on concepts to put the project into an action. The Implementation phase consists of four sub phases: Execution, Monitoring & Control, and Move to Production. Project implementation where visions and plans become reality.

Project Guidelines:

1. The students should work on developing a project during the semester.
2. The students must prefer doing project on some live project given by the concerned teacher of the Department.

SEMINAR

Subject Code: MCAPS1-404 **L T P C**
0021

Seminar Guidelines:

Each student should present Seminar(s) on Latest Technologies in the field of Computer Science on Power Point.

BIG DATA

Subject Code: MCAPD1-411 **L T P C** **Duration: 60 Hrs.**
3 1 0 4

Course Objectives

After completion of this course, the students would be able to:

1. Model and implement efficient big data solutions for various application areas using appropriately selected algorithms and data structures.
2. Analyze methods and algorithms, to compare and evaluate them with respect to time and space requirements, and make appropriate design choices when solving real-world problems.
3. Apply non-relational databases, the techniques for storing and processing large volumes of structured and unstructured data, as well as streaming data.

UNIT-I (17 Hrs.)

Introduction to Big Data-Introduction–distributed file system–Big Data and Its Importance, Four Vs, Drivers for Big Data, Big Data Applications, Algorithms using Map Reduce, Matrix-Vector Multiplication by Map Reduce, Clustering

UNIT-II (14 Hrs.)

Big Data Technology Landscape-Fundamentals of Big Data Types, Big data Technology Components, Big Data Architecture, Big Data Warehouses, Functional vs. Procedural Programming Models for Big Data.

UNIT-III (14 Hrs.)

Big Data Analytics-Big Data Analytics, Framework for Big Data Analysis, Approaches for Analysis of Big Data, ETL in Big Data, Introduction to Hadoop Ecosystem, HDFS, Understanding Text Analytics and Big Data, Predictive analysis on Big Data, Role of Data analyst.

UNIT-IV (15 Hrs.)

Big Data Implementation-Big Data Workflow, Operational Databases, Graph Databases ina Big Data Environment, Real-Time Data Streams and Complex Event Processing, Applying Big Data in a Business Scenario, Security and Governance for Big Data, Big Data on Cloud, Best Practices in Big Data Implementation, Latest Trends in Big Data, Big Data Computation, More on Big Data Storage, Big Data Computational Limitations.

Recommended Books

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, 'Big Data, Big Analytics: EmergingBusiness Intelligence and Analytic Trends for Today's Businesses', Wiley, 1st Edn., **2013**.
2. White T., 'Hadoop: The Definitive Guide', O' Reilly Media, 3rd Edn., **2012.**

DOT NET FRAMEWORK

Subject Code: MCAPD1-413 **LTPC** **Duration: 60 Hrs.**
3104

Course Objectives

1. To know about basic goals of the .NET Framework.
2. A working knowledge of the C# programming language.
3. An understanding of how to use forms to develop GUI programs under .NET.
4. Knowledge of some of the tools available in the .NET Framework class library.

UNIT-I (17 Hrs.)

The .Net framework - Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In – Time Compilation, Framework Base Classes.

UNIT-II (14 Hrs.)

C - Sharp Language (C#) - Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events, Type conversion.

UNIT-III (15 Hrs.)

C# Using Libraries - Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

UNIT-IV (14 Hrs.)

Advanced Features Using C# - Web Services, Window Services, ASP.NET Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#.

Recommended Books

1. E. Balagurusamy, 'Programming in C#', 3rdEdn., Tata McGraw Hill, **2010**.
2. Mark Michaelis, 'Essential C# 3.0: For .NET Framework 3.5', 2ndEdn., Addison Wesley, **2008.**
3. Kogent Course Solutions Inc, 'C# 2012 Programming Black Book Covers .NET 4.5', 1stEdn., Dreamtech Press, **2012.**

MOBILE COMPUTING & ANDROID

Subject Code: MCAPD1-415 **L T P C** **Duration: 60 Hrs.**
3104

Course Objectives

1. Android Application Development course is designed to quickly get you up to speed with writing apps for Android devices.
2. The student will learn the basics of Android platform and get to understand the application lifecycle.

UNIT-I (17 Hrs.)

Introduction to Android - Installing Android Studio, Layouts, Views and Resources, Scrolling Views, Working with TextView Elements.

Activities and Intents - Create and Start Activities, Lifecycle and State Callbacks, Testing and Debugging, and Backwards Compatibility: Debugging and Testing app, Support libraries.

UNIT-II (15 Hrs.)

User Interaction and Navigation - User Input Controls: Use Keyboards, Input Controls, Alerts, and Pickers, Menus and Radio Buttons, Screen Navigation.

Themes and Styles: Theme, Custom Styles, Drawables, adapt layouts for multiple devices and orientations, Using Espresso to test UI

UNIT-III (14 Hrs.)

Connect to the Internet -Google APIs Explorer, JSON, Books API, Use Async Task Loader
Triggering, Scheduling, and Optimizing, Background Tasks: Alarm Manager, Job Scheduler, Firebase Job Dispatcher.

UNIT- IV (14 Hrs.)

Data Saving, Retrieving, Loading - Storing Data using SQLite, Sharing Data: Implement aContent Provider, Loading Data using Loaders, publishing app: Permissions and Libraries, monetizing your app, Making and publishing APKs.

Windows Phone 7- Windows Phone 7 Project, Building an App in Windows Phone 7,Distribution.

Recommended Books

1. Jeff Mcwherter, Scott Gowell, 'Professional Mobile Application Development', 1stEdn., Wrox Publisher, **2012**.
2. Lauren Darcy and Shane Conder 'Teach Yourself Android Application Development in 24 Hrs', 1stEdn., Sams Publications, **2009.**
3. Himanshu Dwivedi, Chris Clark, David Thiel, 'Mobile Application Security', 1stEdn., Tata McGraw Hill, **2010**.

SOFT COMPUTING

Subject Code: MCAPD1-417 **LTPC** **Duration: 60 Hrs.**
3104

Course Objectives

1. To know about the basics of soft computing techniques and also their use in some real life situations
2. To learn the key aspects of Soft computing
3. To understand the features of neural network and its applications

UNIT–I (17 Hrs.)

Introduction - Introduction to Soft Computing, Introduction to biological and artificial neural network, Introduction to fuzzy sets and fuzzy logic systems, Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues.

UNIT–II (15 Hrs.)

Artificial Neural Networks - Different artificial neural network models, Course in artificial neural networks, Neural network applications in control systems, Neural Nets and applications of Neural Network.

UNIT–III (14 Hrs.)

Fuzzy Systems - Fuzzy sets, Fuzzy reasoning, Fuzzy inference systems, Fuzzy control, Fuzzy clustering, Applications of fuzzy systems, Neuro-fuzzy systems, Neuro-fuzzy modeling, Neuro-fuzzy control.

UNIT–IV (14 Hrs.)

Applications - Pattern Recognitions, Image Processing, Biological Sequence Alignment andDrug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

Recommended Books

1. S. Rajasekaran and G.A. Vijaylakshmi Pai, 'Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications', 1st Edn., Prentice Hall India, **2007**.
2. J.S.R. Jang, C.T. Sun and E. Mizutani, 'Neuro-Fuzzy and Soft Computing', 1st Edn., Pearson Education, **2015**.
3. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', 3rd Edn., Wiley, **2011**.

SOFTWARE LAB. - XI
(BIG DATA)

Subject Code: MCAPD1-412 **L T P C**
0021

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-411.

SOFTWARE LAB. - XII
(DOT NET FRAMEWORK)

Subject Code: MCAPD1-414 **L T P C**
0021

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-413.

SOFTWARE LAB - XIII
(MOBILE COMPUTING & ANDROID)

Subject Code: MCAPD1-416 **L T P C**
0021

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-415.

SOFTWARE LAB. - XIV
(SOFT COMPUTING)

Subject Code: MCAPD1-418 **L T P C**
0021

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-417.

MACHINE LEARNING

Subject Code: MCAPD1-421 **L T P C** **Duration: 45 Hrs.**
3003

Course Objectives

At the end of the course, the students should be able to:

1. To learn the basic concepts, techniques and applications of machine learning.
2. To understand the range of machine learning algorithms along with their strength and weakness.
3. To have a thorough understanding of the Supervised and Unsupervised learning techniques.

UNIT–I (11 Hr.)

Introduction- Machine Learning applications, Concept Learning, Types of Machine Learning, Supervised Learning, The Brain and the Neuron, designing a learning system, Issues with machine learning, pattern recognition concepts, classification, regression, feature selection.

UNIT-II (11 Hr.)

Decision Tree Learning- Decision Tree Representation, Appropriate problems for Decision tree learning, Algorithm, Hypothesis space search in Decision tree learning, inductive bias in Decision tree learning, Unsupervised Learning,K means Algorithms, Issues in Decision tree Learning

UNIT-III (11 Hr.)

Artificial Neural networks- Neural Network Representation, Appropriate problems for Neural Network Learning,

Perceptrons, Multilayer Networks and Back Propagation Algorithms, Remarks on Back Propagation Algorithms Case Study: face Recognition

UNIT-IV(12 Hr.)

Instance Based Learning And Genetic Algorithm- K- Nearest Neighbour Learning, Locally Weighted Regression, Radial Bases, Functions, Case Based Reasoning, Genetic algorithms, Genetic Offspring: - Genetic Operators, Using Genetic Algorithms, Models of evolution and Learning

Recommended Books:

1. T. M. Mitchell, 'Machine Learning', McGraw-Hill,**1997.**
2. P. Harrington, 'Machine Learning in Action', DreamTech
3. E. Alpaydin, 'Introduction to Machine Learning', Prentice Hall of India,**2006.**
4. J. Bell, 'Machine Learning: Hands-On for Developers and Technical Professionals', Wiley Publication, **2015**.
5. R. O. Duda, P. E. Hart, and D.G. Stork, 'Pattern Classification', John Wiley and Sons, **2001**

COMPUTER GRAPHICS

Subject Code: MCAPD1-423 **L T P C** **Duration: 45 Hrs.**

3003

Course Objectives

At the end of the course, the students should be able to:

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.

UNIT–I (11 Hrs.)

Computer Graphics- Introduction, Applications of computer graphics, Components of Computer Graphics System.

Input & Output Devices- Keyboard, Touch panel, Light pens, Graphic tablets, Joysticks, Trackball, Data glove, Digitizer, Image scanner, Mouse, Voice Systems, Impact and non-impact printers.

Video Display Devices- CRT systems, Random and Raster Scan Systems, Direct view storage tube. Flat panel displays – Emissive vs Non-Emissive displays, LCD displays, Plasma Panel displays, 3-D viewing devices, Virtual Reality.

UNIT–II (12 Hrs.)

Scan Conversion- DDA and Bresenham line algorithms, Midpoint circle algorithm, Midpoint ellipse algorithm, Area filling techniques (Boundary fill, Flood fill, scan line area fill algorithm), character generation, limitations of scan conversion.

2-Dimensional Graphics- 2D Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, two dimensional viewing transformation and clipping (Cohen –Sutherland, Sutherland-Hodge man algorithms).

UNIT–III (11 Hrs.)

3-Dimensional Graphics- 3D Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection), Composite transformations. Mathematics of Projections – Perspective Projections, Anomalies of perspective projections, Parallel Projections, Introduction to 3D viewing pipeline and clipping.

UNIT–IV (11 Hrs.)

Hidden Line and Surface Elimination Algorithms- Z-buffer, scan-line, Painter's algorithm. **Illumination Models-** Diffuse reflection, Specular reflection, refracted light, texture surface patterns, Half toning, Dithering.

Recommended Books:

1. D. Hearn and M.P. Baker, 'Computer Graphics', 2nd Edn., Pearson, **2002**.
2. Andries van Dam, F. Hughes John, James D. Foley; Steven K. Feiner, 'Computer Graphics Principles and Practice in C', 2nd Edn., Pearson, **2002**.
3. Roy A. Plastock, 'Computer Graphics', 2nd Edn., McGraw Hill, **2000.**
4. F.S. Hill, 'Computer Graphics using OpenGL', 3rd Edn., PHI, **2009.**
5. Jeffrey McConnell, 'Computer Graphics: Theory into Practice', 1st Edn., Jones and BartlettPublishers, **2005.**
6. William M. Newman, 'Principles of Interactive Computer Graphics', 2nd Edn., McGrawHill, **2001.**

FOG COMPUTING AND INTERNET OF THINGS

Subject Code: MCAPD1-425 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives

At the end of the course, the students should be able to:

1. To understand Fog Computing technology and its architecture as well as other emerging technologies.
2. To gain practical know-how about various use-cases of fog computing.
3. To understand the Architectural Overview of IoT.
4. To gain knowledge about smart and intelligent emerging technologies and their usage with IoT.
5. To learn simulators and have hands-on learning on various fog computing and IoT simulators.

UNIT–I (12 Hrs.)

Fog Computing-An overview, principle and architecture of fog computing, definitions and terminology, communication and management of fog nodes, advantages over other technologies, integration with emerging research areas: Internet of Things (IoT), Software Defined Networks (SDNs), Content Delivery Network (CDNs), Network Function Virtualization (NFV), Docker containers, issues and services, resource scheduling and load balancing concepts

UNIT–II (12 Hrs.)

Design principles for connected devices, internet principles, storage and computation in fog nodes, security and privacy issues of fog computing, applications of fog computing including case studies, simulation and emulators tools for fog computing, case study of self-driven cars.

UNIT–III (11 Hrs.)

Internet of Things (IoT): definition, terms and definitions, IoT Concepts: Technologies that led to evolution of IoT, IoT and M2M, IoT and Big Data, IoT Standards: requirement, operating platforms/systems, Components of IoT System, Relevance of IoT for the future: IoT in everyday life, Internet of Everything, IoT and individual privacy.

UNIT–IV (10 Hrs.)

Applications of IoT, IoT for different fields: Smart Cities, Wearables, Smart Home, Self driven cars. IoT in Indian Scenario, Challenges in IoT implementation.

Recommended Books

1. Joshy Joseph, Craig Fellenstein, 'Grid Computing', 1st Edn., Prentice Hall Professional, **2004**.
2. Rajkumar Buyaa, James Broberg, Andrzej Goscinski, 'Cloud Computing Principles and Paradigms', 1st Edn., Wiley, **2011.**
3. Tettamanzi, Andrea, Tomassini and Macro, 'Soft Computing', Springer, **2001**.
4. Rajkumar Buyaa, Vecchiola, Selvi, 'Mastering Cloud Computing', 1st Edn., McGraw Hill, **2013**.
5. ArshdeepBahga, Vijay Madisetti, 'Internet of Things (A Hands -on- Approach)', 1st Edn., VPT, **2014**

SOFTWARE LAB.-XV (MACHINE LEARNING)

Subject Code: MCAPD1-422 **L T P C**
0021

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-421.

SOFTWARE LAB.-XVI (COMPUTER GRAPHICS)

Subject Code: MCAPD1-424 **L T P C**
0021

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-423.
Programs to be covered:

SOFTWARE LAB.- XVII
(FOG COMPUTING AND INTERNET OF THINGS)

Subject Code: MCAPD1-426 **L T P C**
0 0 2 1

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAPD1-425.
Practicals to be covered:
iFogsim:

1. Installation of iFogsim.
2. Creating Fog nodes with heterogeneous configurations
3. Creating different application models: Master-Worker Application Model, Sequential Unidirectional dataflow application model.
4. Application Modules with different configuration
5. Sensors with different tuple emission rate
6. Sending specific number of tuples from a sensor
7. Mobility of a Fog device
8. Connecting lower level Fog devices with nearby gateways
9. Making Cluster of Fog devices
10. Simulation of a Placement Policy
11. Any use-case study

Cupcarbon:

1. Hello World program
2. Calculate the sum of a vector
3. Marking nodes
4. Blinking and LEDs
5. Sending and Receiving messages
6. Routing messages
7. Sending messages in broadcast
8. Sending messages to a group
9. Reading digital/analog sensor values
10. Using many radio modules and standards
11. My coordinates and my neighbors
12. Working with radio parameters
13. Send me your coordinates please
14. Simulate the D-LPCN algorithm