

# MCA Syllabus Book

**w.e.f.**

**July-2018**

**Department of Master of Computer Applications**

Faculty of Management and Information Sciences  
Dharmsinh Desai University  
Nadiad – 387 001, Gujarat, India. <http://www.ddu.ac.in>

# Master of Computer Applications (MCA)

## TEACHING SCHEME

### SEMESTER I

Subject Code	Subject	Teaching Scheme		Exam Scheme					Credit Structure		
		Lec	Prac	Th	Sess	Prac/Viva	TW	Total	L	P	Total
CS 106	Computer Programming with 'C'	4	2	60	40	25	25	150	4	1	5
CS 111	Logical Organization of Computer	4	-	60	40	--	25	125	4	0	4
CS 109	Linux Environment	4	2	60	40	25	25	150	4	1	5
CS 112	Data Communication and Networking	4	-	60	40	--	25	125	4	0	4
	<b>Elective I</b>	4	-	60	40	--	--	100	4	0	4
CS 113	Discrete Mathematical Structure										
CS 110	Financial Management & ERP										
CS 114	Managerial Economics										
CS 115	Management Information System										
<b>Total</b>								<b>650</b>			<b>22</b>

### SEMESTER II

Subject Code	Subject	Teaching Scheme		Exam Scheme					Credit Structure		
		Lec	Prac	Th	Sess	Prac/Viva	TW	Total	L	P	Total
CS 210	Data Structure using 'C'	4	2	60	40	25	25	150	4	1	5
CS 215	Database Management System	4	2	60	40	25	25	150	4	1	5
CS 216	Computer Oriented Numerical & Statistical Methods	4	2	60	40	25	25	150	4	1	5
CS 212	Advance Programming Technique – I [C++]	4	2	60	40	25	25	150	4	1	5
	<b>Elective 2</b>	4	-	60	40	--	25	125	4	0	4
	System Analysis & Design										
	Software Engineering										
	Computer Graphics										
CS 217	Software Project Management										
<b>Total</b>								<b>725</b>			<b>24</b>

### SEMESTER III

Subject Code	Subject	Teaching Scheme		Exam Scheme					Credit Structure		
		Lec	Prac	Th	Sess	Prac/Viva	TW	Total	L	P	Total
CS 326	Recent Trends in ICT	4	2	60	40	25	25	150	4	1	5
CS 327	Core Java	4	2	60	40	25	25	150	4	1	5
CS 328	Introduction to Systems Programming	4	2	60	40	25	25	150	4	1	5
CS 329	Agile Methodology and Python Programming	4	2	60	40	25	25	150	4	1	5
	<b>Elective 3</b>	4	-	60	40	--	25	125	4	0	4
CS 330	Cryptography & Network Security										
	Electronic Commerce										
	Cyber Laws & Intellectual Property Rights										
	Digital Forensics										
<b>Total</b>								<b>725</b>			<b>24</b>

## SEMESTER IV

Subject Code	Subject	Teaching Scheme		Exam Scheme					Credit Structure		
		Lec	Prac	Th	Sess	Prac/Viva	TW	Total	L	P	Total
CS409	Object Oriented System Development	4	0	60	40	0	25	125	4	0	4
CS420	Data Mining	4	2	60	40	25	25	150	4	1	5
CS417	Advanced Java	4	2	60	40	25	25	150	4	1	5
	<b>Elective 4</b>	4	2	60	40	25	25	150	4	1	5
	Enterprise Content Management										
CS428	Cloud Computing										
	Advanced Web Development										
CS418	Advance Programming Technique - II [.Net]										
	<b>Elective 5</b>	4	2	60	40	25	25	150	4	1	5
CS419	Advanced Database Management Systems										
	Analysis and Design of Algorithm										
	Information Retrieval										
	Database Administration										
								725			24

## SEMESTER V

Subject Code	Subject	Teaching Scheme		Exam Scheme					Credit Structure		
		Lec	Prac	Th	Sess	Prac/Viva	TW	Total	L	P	Total
	Software Testing	4	2	60	40	25	25	150	4	1	5
	Mobile Application Development	4	2	60	40	25	25	150	4	1	5
	<b>Elective 6</b>	4	2	60	40	25	25	150	4	1	5
	Service Oriented Architecture										
	Intelligent Systems										
	Internet of Things										
	Game Programming										
	Machine Learning										
	<b>Elective 7</b>	4	2	60	40	25	25	150	4	1	5
	Digital Image Processing										
	Remote Sensing and GIS										
	Big Data Analytics										
	Software Architecture and Design										
	Project	0	6	00	00	100	50	150	0	3	3
	Project-Seminar	0	4	00	00	50	00	50	0	2	2
<b>Total</b>								800			25

## SEMESTER VI

Subject Code	Subject	Teaching Scheme		Exam Scheme					Credit Structure		
		Lec	Prac	Th	Sess	Prac/Viva	TW	Total	L	P	Total
CS 621	Project	0	24	00	00	300	100	400	0	12	12
CS 622	Project-Seminar	0	14	00	00	100	00	100	0	7	7
<b>Total</b>								500			19

# MCA Semester-I

## Computer Programming with 'C'

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Syllabus

#### Overview of C

Why use C? Uses of C, A Brief History of C, C for Personal Computers

#### Structure of a C Program

C's Character Set, The Form of a C Program, The Layout of C Programs, Pre-Processor Directives, Uses of Functions (Available In Most Used Header Files, Comments In a C Program)

#### Data Types – I

Integer Number Variables, Decimal Number Variables, Character Variables, Assignment Statement, Arithmetic Ordering, Variable Declaration

#### Input and Output

printf Function, sprintf Function, The % Format Specifier, scanf Function, Formatting the Output

#### Control Loops

while, do while, Conditions, or Logical Expressions, The for loop



#### Conditional Execution

Program control – if, if..else, if..elseif..else, Using break and continue within loops, Select Paths with Switch

#### Complex Structure and Nesting

Using above Mechanisms, Generate Programs with Complex Looping Mechanisms that Supports Nesting

#### Functions and Prototypes

Functions – C's Building Blocks, Functions and Local Variables, Getting the Value of Variables Into Functions, Function Prototype

#### What is ANSI C?

Standard Library Functions, Data Types – II, Global Variables, Constant Data Types

#### Arrays

Advantage of Using an Array, Declaration and Use of Single-D Array, Declaration and Use of Multi-D Array, Sorting an Array

#### Pointers

Point to Point, Swap Shop, Pointers Linked to Arrays

## **Strings**

Stringing along

## **Structures**

Defining a New Type, Structures and Functions, Pointers to Structures, Memory Management Functions Malloc, Calloc & Free, Structures and Linked Lists, Structures and C, Header Files

## **File Handling**

Stream Files, Text File Functions, Binary File Functions, File System Functions, Command-Line Parameters

## **Text Books:**

1. "The C Programming Language ANSI C Version", Brian W. Kernighan & Dennis Ritchie

## **Reference Books:**

1. "ANSI C – Made Easy", Herbert Schildt Osborne, McGrawHill
2. "Let us C ", Yashwant Kanetkar



## MCA Semester-I

### Logical Organization of Computer

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

### Syllabus

#### Representation of Information

Generation of Computers (Overview), Analog and Digital Computer, Block Diagram of Computer, Positive and Negative Numbers, Integers and Real, Number Systems : Binary, Octal, Decimal and Hexadecimal, Binary Addition, Subtraction, Multiplication and Division, R's and (R- 1)'S Complement, Conversion From One System to Another, Characters and Codes ASCII, EBCDIC, UNICODE (Introduction), Redundant Coding for Error Detection and Correction (Parity and Hamming Code)

#### Basic Logic Design

Basic Gates & Its Truth Tables, Boolean Algebra, Fundamental Concepts of Boolean Algebra, Basic Theorem and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Sum of Product, Product of Sum, K-Map Method (Upto 4 variables), Don't Care Conditions, Combination Circuit Design with AND, OR, NOT, NAND, NOR Gates ,Exclusive- OR and Equivalence Functions, Universal Gates Functionality

#### Arithmetic Logic Unit (ALU)

Block Diagram of ALU, Binary Half and Full Adder, Decimal Adder, Binary Parallel Adder, BCD Adder, Half and Full Subtractor



#### Combinational Circuit

Encoder, Decoder, Multiplexer, Demultiplexer

#### Sequential Logic

Flip Flops: RS, D, T, JK, Asynchronous, Synchronous and Master Slave, Shift Registers (Shift Left and Shift Right), Bidirectional Shift Register with Parallel Load, Counters: Synchronous and Ripple Counter (BCD and Binary), Simple Arithmetic and Logic Circuits

#### Memory Devices

Memory Hierarchy, Random Access Memory, Read Only Memory (Construction of RAM and ROM is not Included), Serial Access Memory (Overview), Direct Access Memory, Cache Memory and Virtual Memory (Overview), Auxiliary Memory (Overview)

#### CPU Architecture

Introduction to 8085 Microprocessor, 8085 Hardware Model, Programmable Registers, Instruction Format, Addressing Modes-Direct, Indirect, Immediate, Relative, Indexed, Addressing Formats: Zero, Single, Double, Register etc., Instruction Set, Instruction Execution, Fetch and Execution Cycles,

Micro-Programming Concept

**I/O Architecture**

Peripheral Devices, Properties of Simple I/O Devices and their Controllers, Asynchronous Data Transfer, Handshaking, Data Transfer Modes, Programmed I/O, Interrupted I/O, DMA, Transfer of Information between I/O Devices, CPU and Memory



**Text Books:**

1. "Digital Logic and Computer Design", M. Morris Mano, PHI
2. "Microprocessor Architecture, programming and applications with 8085", Ramesh S. Gaonker, Panram Int. Pub. (4<sup>th</sup>ed)

**Reference Books:**

1. "Computer System Architecture", M Morris Mano, 3<sup>rd</sup>edition, PHI
2. "Computer Organization and Architecture", William Stallings, 6<sup>th</sup>edition, PHI
3. "Structure Computer Organization", Andrew S Tanenbaum, 4<sup>th</sup>edition, Pearson Education



## MCA Semester-I Linux Environment

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Syllabus

#### Linux Contents and Applications

Kernel Shell Relationship, Features of Linux, How does it differ from DOS

#### Understanding the Linux Commands Locating Commands

Internal and External Commands Arguments, Options and Filenames Flexibility of Command Usage, man Command

#### General Purpose Utilities

cal, date, bc, who, tty, uname, passwd, echo, printf, stty, tput, script

#### File System

Parent Child Relationship, Concept of PATH, Home Directory, pwd, Absolute Pathnames, Relative Pathnames, cd, mkdir, rmdir, ls command

#### Handling Ordinary Files

cat, cp, rm, mv, more, file, wc, od, split, cmp, comm, diff, gzip, tar

#### The Shell

Shell's Interpretive Cycle, sh Command, Pattern Matching-Wildcard Characters, Escaping, Quoting, Redirection, /dev/null and/dev/tty Two Special Files, Pipes, tee Command, Command Substitution, Shell Variables

#### The Environment

Environment Variables, Common Environment Variables, .profile, History command, Aliases, set options, \$\_

#### Basic File Attributes

ls- l Listing File Attributes, Listing Directory Attributes , File Permissions, chmod Command, Directory Permission, File System and Inodes, Hard Links, Symbolic Links and ln Command, umask, find-Locating Files

#### Simple Filters

head, tail, cut, paste, sort, uniq, tr

#### Filters Using Regular Expressions With grep and sed Command

grep Basic Regular Expression, Extended Regular Expressions-egrep  
sed Command: Line Addressing, Multiple Instructions, Context Addressing, Text Editing,  
Substitution, Remembered Pattern, Repeated Pattern(&), Interval Regular Expression

### **The Process**

Process Basics, sh Process, Parents and Children Process, ps Command, System Process, Internal and External commands, kill, nice

## **The Shell Programming -Shell Scripts**

read Command, Command Line Arguments, exit Status, Logical Operators, if, case, expr, test, sleep and wait, while Loop, for Loop, Introduction to an Array

## **Basic System Administration**

Linux File Systems, Disks, Basic Concepts of Character Devices and Block devices, mount command, Managing Groups, Adding Users, Removing Users, Changing User password, Overview of Boot Block, Super Block, Data Block, Inode Block

## **Text Books:**

1. "UNIX- Concepts and Applications", Sumitabha Das, 4<sup>th</sup>Edition, TMHPublication
2. "Unix Shell Programming", Yashvant P.Kanetkar

## **Reference Books:**

1. "Advanced UNIX- A Programmer's Guide", Stephen Prata, BPB Publication
2. "The UNIX Programming Environment", Kernighan and Pike, PHI Publication
3. "Unix and Shell Programming", Behrouz A. Forouzan, Richard F. Gilberg, Thomson
4. "RedHat Enterprise Linux 7RH124 RedHat System Administration1", Susan Lauber, Philip Sweany, Rudolf Kasti, George Hacker



## MCA Semester-I

### Data Communication and Networking

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

### Syllabus

#### Introduction

Data Communications, Networks, Internet, Protocols and Standards, Layered Tasks, The Internet Model, The OSI Model

#### The Physical Layer

Analog and Digital Data, Analog and Digital Signals, Concept of Bandwidth for Analog, Digital and Composite Signals, Analog versus Digital, Data Rate Limits, Transmission Impairments, Throughput, Propagation Speed, Propagation Time and Wavelength of Signal. Transmission Mode: Parallel, Serial, Synchronous and Asynchronous, Bit Rate and Baud Rate, Need for Modulation of A Signal, Overview of AM, FM and PM

Working of A Multiplexer, Demultiplexer, Overview of FDM, TDM and WDM Transmission Media: Guided and Unguided Circuit Switching and Telephone Networks, Different Switches Based Upon Space Division, Frequency Division, Time Division, Lata

#### The Data Link Layer

Error Detection and Correction, Flow and Error Control, Stop and Wait ARQ, Go Back N ARQ, Selective Repeat ARQ, HDLC, PPP Protocol, PPP Stack, HDLC, Multiple Access Protocols: Random Access, Controlled Access and Channelization, Local Area Networks

Introduction of Ethernet Standard, Traditional Ethernet, Fast Ethernet and Gigabit Ethernet Introduction of Network Interface Devices: Repeaters, Hubs, Bridges, Switches, Backbone Networks, Virtual LANs

#### The Networking Layer

Internetworks, Addressing, Routing.

Overview of Network Layer Protocols: ARP, RARP, IP and ICMP

The IPV6 Addressing Format, Unicast Routing and Unicast Routing Protocols, Multicast Routing and MBONE

#### The Transport Layer

Process-To-Process Delivery, Overview of UDP and TCP, Concepts of Congestion Control: Data Traffic, Congestion and Congestion Control in TCP

#### The Application Layer

Overview of Client Server Model, DNS, Distribution of Name Space, DNS In The Internet, Resolution and DNS Messages DHCP, SMTP And FTP, HTTP, WWW 2

**Text Books:**

1. "Data Communication and Networking" By: Behrouz Fourozan (TMH Publications)

**Reference Books:**

1. "TCP/IP Protocol Suite" By: Behrouz Fourozan (TMH Publications)
2. "Communication Networks" By: Alberto Leon-Garcia, Indra Widjaja
3. "Computer Networks" By: Andrew S. Tanenbaum

# MCA Semester-I

## Discrete Mathematical Structure

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	-	100	4	0	4

### Syllabus

#### Sets and Propositions

Combination, Finite, Uncountable Infinite and Infinite Sets, Mathematical Induction, Principles of Inclusion and Exclusion, Propositions, Tautology and Contradiction

#### Permutations, Combinations, Discrete Probabilities

Rules of Sums and Products, Permutations, Combinations, Generation, Discrete Probability, Conditional Probability

#### Relations and Functions

Relational Model of Databases, Properties of Binary Relations, Equivalence Relation, Partitions, Partial Ordering, Lattices, Chains and Antichains, Functions and Pigeon-hole Principle

#### Graphs

Basic Terminology, Multi- and Weighted Graphs, Paths, Circuits, Shortest Path, Eulerian Path, Traveling Salesman Problem, Factors of a Graph, Planar Graphs, Operations on a Graph, Matrix Representation of Graph, Graph Traversal

#### Trees

Trees, Rooted Trees, Path Length, Prefix Codes, Binary Search Trees, Spanning Trees, Minimum Spanning Trees, Transport Networks Using Ford-Fulkerson, Huffman's Algorithm, Algorithm To Find Max Spanning of a Tree

#### Computability and Formal Languages

Russel's Paradox and Non-computability, Ordered Sets, Languages, Phrase - structured Grammars, Types of Grammars and Languages

#### Recurrence Relations

Linear Recurrence Relations with Constant Coefficient, Homogeneous, Particular and Total Solutions, Generating Functions, Matrix Multiplication

#### Group

Groups and Sub-Groups, Generators, Evaluation of Powers, Cosets, Lagrange's Theorem, Permutation Group and Burnside's Theorem, Group, Codes, Isomorphism, Automorphism, Homomorphism, Normal Subgroups, Rings, Integral Domains and Fields, Ring Homomorphism, Polynomial Rings

#### Text Books:

1. "Elements of Discrete Mathematics", C.L. Liu, 2nd Ed., McGraw-Hill
2. "Discrete Mathematics ", S. K. Chakraborty and B. K. Sarkar, Oxford University Press

**Reference Books:**

1. "Modern Applied Algebra ", Birkoff and Bartee, McGraw-Hill, CBS
2. "Discrete Mathematics A Unified Approach", Stephen A. Wiitala., Computer Science Series, McGraw-Hill



## MCA Semester-I

### Financial Management and ERP

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	-	100	4	0	4

### Syllabus

#### Nature of Accounting & Analysis of Business Transactions:

Definition, Objective & Scope, Concepts, Principles and Convictions in Accountancy, Advantages, Disadvantages, Meaning of an Account, Classification of an Accounts, Rules of Debit and Credit

#### Accounting Cycle

Passing of Entries in books of Accounts – Trial Balance –Final Accounts – Current Assets – Current Liabilities – Other Liabilities – Owner Equities – Trading Account – Record and Systems – Control Accounts and Subsidiary Ledgers –Limitations of Profit & Loss Account & Balance sheet

#### Interpreting Accounts and Financial Statement

Use of Ratios in interpreting Financial Statements – Limitations – Other methods of Evaluation

#### Introduction to ERP

Evolution of ERP, What is ERP?, Reason for the Growth of the ERP market, Advantages of ERP, Why do many ERP Implementations fail?, Why are ERP packages Being used now?

#### ERP models

Finance Sales and Distribution, Manufacturing Human Resources, Plant Maintenance, Quality Management, Purchasing, Marketing, Production Planning, Materials Management

#### Benefits of ERP

Reduction of Lead Time, On Time Shipment, Reduction in Cycle time, Improved Resource

#### Text Books:

- 1.“Financial Accounting & Management”, Rana T. J., B.S. Shah Pub
2. “Financial Accounting”, Khan & Jain
- 3.“Advanced Accounts”, Shukla M.C. & Grawal T.S., Chand Pub
- 4.“Advanced Accounts”, R. L. Gupta, Sultan Chand Publication
- 5.“Enterprise Resource planning”, Alexis Leon, Tata McGrawHill

#### Reference Books:

- 1.“Enterprise Systems for Management”, Luvai F. Motiwalla, Jeff Thompson,PHI
- 2.“ERP Demystified”, Alexis Leon, McGraw-Hill Education (India) Ltd., 2<sup>nd</sup>Edition

## MCA Semester-I Managerial Economics

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	-	100	4	0	4

### Syllabus

#### Introduction

Nature and Scope of Managerial Economics - Fundamental Concepts used in Managerial Economics - Methods of Economic Analysis for Managerial Decision Making - Objectives of a Firm - Profit Maximization Vs Wealth Maximization

#### Consumer Behavior and Demand Analysis

The Theory of Consumer Behavior, Concept of Utility, Marginal Utility Analysis, Consumer Surplus, Indifference Curve Analysis, Concept of Demand, Law of Demand, Demand Determinants, Elasticity of Demand, Types Measurement of Elasticity of Demand, Demand Forecasting

#### Production Analysis

Laws of Production, The Production Function, ISO Cost and ISO Quant Curves, Equilibrium of the Firm and Industry, Choice of Optimal Combination of Factors of Production, Choice of Optimal Expansion Path, The Law of Supply, Derivation of Supply Curve, Market Analysis

#### Pricing Under Various Competitive Situations

National Income Analysis/ Measurement/ Growth Rates, Indian Economy, Planning and Development in India, Development Strategies, Five Year Plans, Poverty, Food & Population Problems. Break Even Analysis.

#### Text Books:

1. "Managerial Economics" by Varshney and Maheshwari, Sultan Chand and Sons, NewDelhi
2. "Indian Economy", Mishra & Puri Himalaya Publishing House

#### Reference Books:

1. "Managerial Economics – Analysis, Problems and Cases", P.L. Mehta, Sultan Chand Sons, NewDelhi
2. "Managerial Economics", D. Salvatore, McGraw Hill, NewDelhi
3. "Managerial Economics", Pearson and Lewis, Prentice Hall, NewDelhi
4. "Managerial Economics", G.S. Gupta, T M H, NewDelhi

## MCA Semester-I

### Management Information System

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	-	100	4	0	4

### Syllabus

#### Introduction to Management Information Systems

MIS: Concept and Definition, Role and Impact of MIS, MIS and the Users, Management as a Control System, Management Effectiveness and MIS, Organizations as a System, MIS: Organizations Effectiveness

#### Decision Making

Decision Making Concepts, The Decision Making Process, Decision Analysis by Analytical Modeling, Behavioral Concepts in Decision Making, Organizational Decision Making, MIS and Decision Making

#### Information

Information concepts, Information: A Quality Product, Classification of Information, Value of Information, MIS and the Information

#### Development of MIS

Development of Long Range Plans of MIS, Ascertaining the Class of Information, Determining the Information Requirement, Development and Implementation of the MIS, Management and Information Quality in MIS, Organization for Development of MIS, MIS: Development Process

#### Types of IS

Executive Support Systems (ESS), Management Information Systems (MIS), Decision Support Systems (DSS), Knowledge Management Systems (KMS), Transaction Processing Systems (TPS), Office Automation Systems

#### ERP Models

Finance Sales and Distribution, Manufacturing Human Resources, Plant Maintenance, Quality Management, Purchasing, Marketing, Production Planning, Materials Management

#### Benefits of ERP

Reduction of Lead Time, On Time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Utilization, Improved Supplier Performance

#### ERP implementation life cycle

Pre Evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering Configuration, Implementation Team Training, Testing, Going Live, End-User Training, Post Implementation

#### Extended ERP

**Text Books:**

1. "Management Information Systems" by Waman S Jawadekar, Tata McGrawHill
2. "Enterprise Resource Planning" by Alexis Leon, Tata McGrawHill

**Reference Books:**

1. "Management Information Systems- A Managerial Perspective" by Uma G. Gupta, Galgotia Publication
2. "Enterprise Systems for Management" - Luvai F. Motiwalla, Jeff Thompson,(PHI)
3. "ERP Demystified" (Second Edition) - Alexis Leon, McGraw-Hill Education (India) Ltd., 2007.



## MCA Semester-II Data Structure Using C

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Syllabus

#### Introduction to Data Structure

Primitive & Non-primitive Data Structures, Operations on Primitive Data Structure, Algorithm Analysis for Time and Space Requirements. Storage Management (Array Representation, Pointer Overview)

#### String Manipulation

Definitions and Concepts, String Manipulation and Pattern Matching, Primitive Function, Composite Functions, Strings Manipulation In 'C' and its Application

#### Recursion

Recursive Definition, Recursion In C, Writing Recursive Programs, Efficiency of Recursion

#### Stack and Queue

Definition of Stack, Application of Stack, Representation of Stack using Array, Implementing Operations on Stack, Uses of Stack (Postfix, Infix, Prefix Examples using Stack.), Definition of Queue, Application of Queue, Representation of Queue using Array, Circular Queue

#### Linked List

Representation of Single Linked List using Array and Pointer, Operations on Singly Linked List, Insertion as a First Node, Insertion as a Last Node, Insertion of a Node at Specific Location, Deletion of First Node, Deletion of Last Node, Deletion of a Desired Node, Searching for the Particular Element, Sorting the Linked List, Reversing the List, Traversing a Linked List

Doubly Linked List, Representation of Doubly Linked List, Operations of Doubly Linked List, Insertion as a First Node, Insertion as a Last Node, Insertion of a Node at Specific Location, Deletion of First Node, Deletion of Last Node, Deletion of a Desired Node, Searching for the Particular Element, Sorting the Linked List, Traversing a Linked List

Circular Linked List, Representation of Circular Linked List, Inserting and Deleting a Node

#### Non-Linear Data Structures

Definition of Tree, Representation of Tree, Types of Tree, Binary Tree Traversal, Storage Representation and Manipulation of Binary Tree, Conversion of General Tree to a Binary Tree, Other Representation of Tree, Application to Tree, Representation of Graphs, Graph Traversal and Spanning Forest. Finding the Shortest Path (Warshall's Algorithm, Warshall's Modified Algorithm,

Dijkstra's Technique), Graph Traversal (Depth First Search, Breadth First Search)

**Sorting And Searching Methods.**

Linear Search, Binary Search, Sorting Methods, Internal and External Sorting, Bubble Sort, Quick Sort, Merge Sort, Partition Exchange Sort, Shell Sort, Insertion Sort, Selection Sort, Radix Sort, Address Calculation Sort, Heap Sort.

**Text Books:**

1. "An Introduction to Data Structures With Their Applications", Trembley and Sorenson
2. "Expert Data Structures With C", R. B. Patel

**Reference Books:**

1. "Data structures using C and C++", Y. Langsam, M. J. Augenstein, A. M. Tenenbaum



## MCA Semester-II

### Database Management System

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Syllabus

#### Introduction to Database Management System

Database System Applications, Database Systems versus File Systems, View of Data, Data Models, Database Languages, Database Users and Administrators, Transaction Management, Database System Structure, Application Architectures, History of Database Systems

#### Entity Relationship Model

Basic Concepts, Constraints, Keys, Design Issues, Entity Relationship Diagram, Weak Entity Sets, Extended ER Features, Design of an ER Database Schema, Reduction of an ER Schema to Tables

#### Relational Model and Basic

Structure of SQL Structure of Relational Databases, The Relational Algebra, Extended Relational Algebra Operations, Modification of the Database, Views, Basic Structure of Structured Query Language, the Select Clause, the Where Clause, the From Clause, (The above Clauses has to be Taught so that an Equivalent SQL Statement for a Relational Algebra can be Developed)

#### Integrity and Security

Domain Constraints, Referential Integrity

#### Relational Database Design

First Normal Form, Pitfalls in Relational Database Design, Functional Dependencies, Decomposition, Desirable Properties of Decomposition, Boyce Codd Normal Form, Third Normal Form, Fourth Normal, More Normal Forms, Overall Database Design Process

#### Storage and File Structure

Overview of Physical Storage Media, RAID, Storage Access, File Organization, Organization of Records in Files, Data Dictionary Storage

#### Indexing and Hashing

Basic Concepts, Ordered Indices, B+ Tree Index Files, B Tree Index Files, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Multiple Key Access

#### Transactions



Transaction Concept, Transaction State, Need for concurrent executions, Serializability concept

### **Concurrency Control**

Idea about Locking using Lock Based Protocol and Time Stamp Based Protocol, Deadlock Handling, Insert and Delete Operations

### **Recovery System**

Failure Classification, Storage Structure, Recovery and Atomicity, Log Based Recovery, Shadow Paging

### **Database System Architectures**

Centralized and Client Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems, Network Types

### **Text Books:**

1. "Database System Concepts", Abraham Silberschatz, Henry F. Korth and S. Sudarshan, 4th Edition, McGraw Hill Publication



## MCA Semester-II Computer Oriented Numerical & Statistical Methods

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Syllabus

#### Statistical Methods (65%)

Scope of Statistics, Collection of Data

#### Frequency Distribution (F.D.)

#### Graphical Presentation of F.D.

#### Measure of Central Tendency

#### Measure of Dispersion, Skewed Curves

#### Coefficient of Variations & Coefficient of Skewness

#### Definition of Probability, Sample Space & Events

#### Theoretical Distributions

Binomial, Multinomial, Poisson, Normal

#### Statistical Inference

Random Sampling, Test of Hypothesis (Except Testing the Significance of an Observed Correlation Coefficient)

#### Test & Goodness of Fit, F-Test.

Except Yate's Correlation

#### ANOVA (Analysis Of Variance)

#### Time series Analysis

#### Numerical Methods (35%)

Iterative Methods, Bisection, False-Position, Newton-Raphson Methods, Euler's Methods, Runge-Kutta Methods

## **Interpolation**

Polynomial Interpolation, Difference Tables, Newton Forward and Backward Interpolation Formula, Lagranges Formula, Newton's Divided Difference Formula

## **Numerical Integration**

Trapezoidal Rule, Simpson's Rules

## **To Solve Simultaneous Linear Equations**

Gauss Elimination Method

## **Text Books:**

1. "Numerical Methods ", S. S.Sastry
2. "Statistical Methods", S. P.Gupta

## **Reference Books:**

1. "Quantitative Analysis for Business Decisions", Bobby Srinivasan & C.L. Sandblom, 1<sup>st</sup>edition, McGraw Hill



## MCA Semester-II

### Advance Programming Technique – I [C++]

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Syllabus

#### Object-oriented Programming Concepts and Beginning with C++

#### Tokens, Expressions and Control Structures

#### Functions in C++

#### Classes and Objects

#### Constructors and Destructors

#### Operator Overloading

#### Type Conversion

Basic to Class Conversion, Class to Basic Conversion, Class to Class Conversion

#### Inheritance

Definition and Types of Inheritance, Single, Multiple, Multilevel, Hierarchical, Hybrid Inheritance, Virtual Base class, Constructors in Derived class, Nesting of Classes

#### Pointers and Virtual Functions

Pointer to Objects, This Pointer, Pointer to Data Members and Member Functions, Virtual Function and Pure Virtual Function

#### Polymorphism

Definition and Types of Polymorphism, Compile-Time Polymorphism, Runtime Polymorphism, Abstract Base Class

#### Managing Console I/O Operations

C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Manipulators

#### Working With Files

Classes for File Stream operations, open() Function, File Opening Modes, File-Pointer Manipulation, Sequential and Random File Access, Handling Exceptions

#### Text Books:

1. "Object Oriented Programming with C++" by E. Balagurusamy, McGrawHill **2018-2021 Batch**

**Reference Books:**

1. "Turbo C++" by Robert Lafore, PHI Publications

## MCA Semester-II

### System Analysis & Design

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

### Syllabus

#### System Analysis & Design

Information System, Functions and Uses in the Organization, Users of Information Systems, Categories

#### Transaction Processing System and its Proccession Mode

Batch, Online, and Real, Management Information System, Decision Support System, Needs and Impacts of Computers in the Organization, Manual and Computerized Information System

#### Problems with Computerization, Disadvantages of Computers in Application, System Analysts Responsibilities and Personal Characteristic Required

#### System Development Life Cycle Method

System Analysis, Design and Implementation, Phases Inception, Reason for Project Request, Source of Project Request, Preliminary Study, Request Clarification

#### Feasibility Study

Technical, Operational and Financial Feasibility, Request Approval, Project Selection Requirement and Methods Steering Committee, Information System Group etc. Scope, Boundary and Objective of the Project Undertaken, Analysis using Fact Finding Techniques Interviews, Observation, Questionnaire, Record Review

#### Decision Analysis

Structured English, Decision Tables, Methods of Performing Cost Benefit Analysis, System Design Logical and Physical Design, Selection of Hardware and Software, Criteria to Evaluate Hardware and Software

#### Structured Analysis Development Method

Data Flow Analysis, Developing Logical Model of the System using Data Flow Diagram, Data Dictionary, HIPO Chart, Visual Table of Content, System Flow Chart, Data Structure Diagram, Entity Relationship Diagram

#### Logical Design of the System

Analysis to Design Transition, Analysis of Facts, Elements of Design, Design of Inputs, Outputs, Files, Procedures, Controls, Program Specifications, Interfacing Methods, Menus, Online Dialogues, Managing the Design Process, Managing End-User Developed System

#### Documentations

System, Design, Operational, User, Time Chart, Budget Chart

## **System Installation**

Planning, Equipment Installation, Program Developments, Design and Documentation of Software, Program and System Testing, Errors, File Conversions, User Training, Performance Evaluation of the System, Quality Assurance, Post-Implementation Review

## **Prototype Methodology**

Steps to Follow, Packages: Characteristics and Requirements, Categories of Packages, Criteria to Evaluate Packages, Fourth Generation Languages and its Tools, End-User Developed System

## **Introduction to Software Project Management**

### **MIS (Management Information System)**

Introduction, Importance of MIS - Computer & MIS - Organization Structure & MIS Future of MIS., MIS: the factor of Success and Failure

### **Information System and Organization.**

Introduction, Data & Information, Management & Decision making, Information Support for Functional Areas of Management, Impact of Business on Information System - Organizing Information System, MIS and Information Concept

### **Classification of MIS**

DSS, TPS, OAS, ESS, ES, EIS

### **Text Book:**

1. "Analysis, Design and Implementation of an Information System", Henry Lucas, McGrawHill
2. "Analysis and Design of an Information System", James Senn, McGrawHill
3. "Management Information Systems A Managerial Perspective", Uma Gupta, Galgotia Publications Pvt Ltd

### **Reference Books:**

1. "Information System Concept for Management", H. Lucas, McGraw Hill(1987)
2. "System Analysis and Project Management", Cleland and King, McGraw Hill(1983)





## MCA Semester-II

### Software Engineering

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

### Syllabus

#### Introduction, Process Model, Agile Development

Introduction: Define Software, Types of Software

Software Engineering, Generic Software Process Framework Process Model: Water Fall, Prototype, Evolutionary Process Model

Agile: Agility, Agile Process, Agility Principals, Agile Process Models & Overview of Extreme Programming

#### Requirement Engineering

Functional and Non Functional Requirements, Software Requirements Document, Requirement Specification, Requirements Engineering Process, Requirements Elicitation and Analysis, Requirements Validation, Requirements Management

#### Software Project Management

Responsibilities of a Software Project Manager, Project Planning, Metrics or Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO Model, An Analytical Technique, Staffing Level Estimation, Scheduling, Organization and Team Structures, Staffing, Software Configuration Management

#### Software Design

Design Process, Overview of Design Concepts: Modularity, Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Refinement, Aspects, Refactoring

Function Oriented Software Design: DFDs, Data Dictionary Design, Types of Cohesion and Coupling

#### User-Interface Design

Interface Analysis and Design Model, Analysis and Design Process of User Interface, Interface Analysis: User Analysis, Task Analysis and Modeling, Interface Design Steps

Webapp- Interface Design: Interface Design Principal and Design, Interface Design Workflow for Webapps, Design Evaluation

#### Coding & Testing

Coding Standard and Guideline, Code Review Technique

Testing: Verification and Validation, Overview of Testing Strategy, Overview of Unit Testing, Integration Testing, System Testing, White Box Testing, Black Box Testing

#### Software Reliability and Quality

Element of Quality Insurance, SQA Task and Goals, Statistical Quality Assurance, Software

Reliability, ISO 9000 Quality Standard

### **Risk Analysis & Management**

Risk Identification, List out Risk Projection Step, Risk Mitigation, Monitoring and Management

## **Software Maintenance**

Software Maintenance, Re-Engineering, Software Re-Engineering Activities, Reverse Engineering, Restructuring

### **TextBook:**

1. "Software Engineering: A Practitioner's Approach", Rojer S. Pressman, 7<sup>th</sup> Edition McGraw Hill Publication
2. "Fundamentals of Software Engineering", Rajib Mall, Prentice Hall India

### **Reference Book:**

1. "Software Engineering", Ian Sommerville, Addison and Wesley



## MCA Semester-II Computer Graphics

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

### Syllabus

#### Introduction

What is Computer Graphics? (Pixel, Frame Buffer, Resolution, Aspect Ratio), Application of Computer Graphics

#### Graphics Devices

Display Systems: Raster Scan, Random Scan

Input devices: Digitizing Tablets: Electromagnetic, Electrical, Acoustic type Mouse: Mechanical and Optical Track Ball, Data Gloves, Light Pen

Touch Panels: Optical, Capacitive and Sonic Type

Image Scanner: Types, Typical Resolutions, Sizes, Output Formats

#### Graphics Primitives

Graphic File Format of BMP: Header, Bitmap data (Scan Line and Planar data), Color palette Graphic

File Format of PNG: Header, Chunks, Pixel Format, Transparency, Compression

#### Drawing Geometry

Mathematics for Computer Graphics: Polar Coordinates in xy-plane, Vectors: Scalar Product and Cross Product, Matrices: Scalar Multiplication, Matrix Addition and Multiplication, Inverse

Line Drawing: Lines, Line Segments, Perpendicular Lines, Distance Between a Point and a Line, Pixel, Frame Buffer, A Simple Line Drawing Algorithm

Translation, Rotation, Scaling, Mirror Reflection Rotation about an Arbitrary Point

Vector Generation: Using DDA (Digital Differential Algorithm), Bresenham's Algorithm

Antialiasing of Lines, Thick Line Segment

Character Generation: Stroke Method, Dot-Matrix or Bitmap Method

#### Curves and Polygon

Bresenham's Circle Drawing Algorithm, Generating Ellipse

Curve Drawing: Parametric Representation, Drawing the Bezier and B-Spline Curves Interpolation

Polygon: Representation, Inside Test (Even-odd Method), Filling Polygon (Scan Line Fill Algorithm, Region Fill Algorithm, Flood Fill algorithm, Boundary Fill Algorithm)

#### Graphics Operations

Clipping: Window-port and View-port, Line Clipping with Respect to a Rectangular Window Using

Line End Point Codes, S-C (Sutherland-Cohen) Line Clipping Algorithm  
Filling: Stack-based, Seed Fill, Generation of Bar Charts and Pie Charts

## **2.D and 3-D Transformation**

Fundamental Transformation: Translation, Scaling, Rotation Other Transformations: Reflection, Shearing

Homogenous Coordinates

Projection: Parallel Projection (Multiview, Oblique view), Perspective

Hidden Surface Removal: Back-face, Floating Horizon Technique, Z-buffer, Ray Tracing

### **Text Books:**

- 1." Fundamentals of Computer Graphics and Multimedia", D. P. Mukherjee, PHI
2. "Computer Graphics A Programming Approach", Steven Harrington, McGraw-Hill International Edition
- 3." Computer Graphics", Donald Hearn & M Pauline Baker, PHI

### **Reference Books:**

- 1."Graphics under C", Yashvant Kanetkar, BSP
2. "Computer Graphics – Principle and Practices", Foley, van Dam, Feinerly Huges (AddisonWesley)
3. "Theory and Problems of Computer Graphics", Roy A Plastock & Gordan Kalley (Schaum's Outline Series)



## MCA Semester-II Software Project Management

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

### Syllabus

#### Review of Software Engineering Concepts

Principles of Software Engineering, Features of Good Software, Quality Requirement in Different Application Areas

#### Software Process

Software Process and Models, Tools and Techniques of Process Modeling, Product and Process

#### Introduction to Project Management

Definition of the Project, Project Specification and Parameters, Principles of Project Management, Project Management Life Cycle

#### Software Project Planning

Project Activities and Work Breakdown Structure (WBS), Criteria for Completeness In The WBS, Activity Resource Requirements and Cost, Joint Project Planning Session, Project Management Plan

#### Project Economics

Project Costing, Empirical Project Estimation Techniques, Decomposition Techniques, Algorithmic Methods, Automated Estimation Tools

#### Project Scheduling and Tracking Techniques

Why are Projects Delayed? Effort Estimation Techniques, Task Network and Scheduling Methods, Monitoring and Control Progress, Graphical Reporting Tools

#### Risk Analysis and Management

Risk Concepts and Identification, Risk Assessment and Control, Risk Components and Drivers, Risk Tracking and Monitoring, Risk Mitigation and Management

#### Software Metrics and Project Management

Measures, Metrics and Indicators, Process and Project Metrics, Statistical Metrics and Process Monitoring, Function-point and Project Management

#### Project Control and Closure

Defect Collection and Audit, Causal and Pareto Analysis, Project Closure Analysis

**Text Books:**

1. "Software Project Management for Small to Medium Sized Projects", John J. Rakos, 1998, Prentice Hall
2. "Software Project Management: A Unified Framework", Walker Royce, 2001, Addison- Wesley Professional
3. "Software Project Management in Practice", Pankaj Jalote, 2001, Addison-Wesley Professional

**Reference Books:**

1. "Software Engineering: A Practitioner's Approach", Roger S. Pressman, 7<sup>th</sup> Edition, McGraw Hill
2. "Software Engineering", Ian Sommerville, 8<sup>th</sup> Edition, Pearson Education, 2006.
3. "A Guide to the Project Management Body of Knowledge", (PMBOK® Guide) (4<sup>th</sup> Edition), 2008, Project Management Institute





## MCA Semester-III

### Recent Trends in ICT

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Prerequisites

Fundamentals of Internet Technologies and DBMS

### Course Learning Outcomes

After successful completion of the course, student will be able to:

- develop web applications using open source technologies
- learn PHP scripting language, deploy application on server and configure web server
- learn MySQL database deployment for web applications

### Syllabus

#### Introduction to Open Source Software, their Configuration and PHP

Overview of Open Source Software, Widely used Open Source Products, Development Philosophy, Open Source Vs. Closed Source, Open Source Software Vs. Free Software, Open Source Vs. Source-Available, Pros and Cons, Development Tools, The Distribution Terms of Open Source Software, Open Source Technology Importance, Free and Open Source Software (FOSS).

Configuring Apache, Configuring Mysql, Configuring PHP, Evaluation of PHP, Basic Syntax, Defining Variable and Constant, PHP Data Type, Operator and Expression

#### Handling HTML Form with PHP and Exception Handling

Capturing Form Data, Dealing with Multi-Value Fields, and Generating File Uploaded Form, Redirecting a Form after Submission

Using Radio Buttons, Checkbox, List Box, Buttons, Text Box, etc., Processing User Input, Handling and Avoiding Errors, Exception Handling

#### Decisions and Loops, Functions, Strings and Arrays

Making Decisions, Doing Repetitive Task with Looping, Mixing Decisions and Looping with Html Defining Function, Call by Value and Call by Reference, Recursive Function

String: Creating and Accessing Strings, String Searching & Replacing, Formatting String, String Related Library Functions

Anatomy of An Array, Creating Index Based and Associative Array, Accessing Array Element, Looping With Index Based Array, Looping With Associative Array Using Each() and Foreach(), Useful Library Functions

String Matching With Regular Expression: What Is Regular Expression? , Pattern Matching In PHP, Replacing Text, Splitting a String with a Regular Expression

## **Building Content Management System**

Overview of Content Management System, Coding For Reusability (Header.php), User Management, Article Publishing, Additional CMS Features, Introduction to Joomla

## **Working with File and Directories**

Understanding File & Directory, Opening and Closing a File, Coping, Renaming and Deleting a File, Working with Directories, Building a Text Editor, File Uploading & Downloading

State Management: Using Query String (URL Rewriting), Using Hidden Field, Using Cookies, Using Session

Generating Images with PHP: Basics of Computer Graphics, Creating Image, Manipulating Image, Using Text inImage

## **Introduction to OOPS and Use of MVC Architecture**

Introduction Objects, Declaring a Class, The New Keyword and Constructor, Destructor Access Method and Properties Using \$This Variable, Public, Private, Protected Properties and Methods Static Properties and Method Class Constant Inheritance & Code Reusability Polymorphism Parent::& Self:: Keyword Instance of Operator Abstract Method and Class Interface Final

MVC Architecture:

Understanding Controller: Request & Response Parameter, Controller Action, Request Life Cycle Callbacks, Controller Method, Redirection, Working with Component

Understanding Model: Creating Model for Database Table, Retrieving Data using Model, Method for all Basic CRUD(Create, Read, Update, Delete), Create Own Model Method, Making Custom SQL Queries Data Validation

Understanding View: Working with Layout, Create Custom Layout, Working with Helper Class, Creating and Using User Define, Helper, Working with Element

## **Database Connectivity with Mysql**

Introduction to RDBMS, Connection with Mysql Database, Performing Basic Database Operation (DML) (Insert, Delete, Update, Select), Setting Query Parameter

## **PHP and AJAX, CSS, Java Script and Jquery**

AJAX: The Purpose of Ajax, The XMLHttpRequest Object, Ajax Using the POST Method Displaying and Updating Records XML and Ajax: Creating a DOM Document with Java Script Accessing, Creating and Modifying XML Nodes, Loading XML Data into an HTML Page Receiving XML Responses, Handling Response XML

CSS: Introduction to CSS, Three Ways to Use CSS, CSS Properties, Designing Website, Working with Templates

Java Script: Introduction to Java Script, Three Ways to Use Java Script, Working with Events, Client-Side Validation.

Jquery: Introduction to Jquery, Validation Using Jquery, Jquery Forms, Jquery Examples

## **Text Books:**

- 1."Beginning PHP5, Apache, and Mysql Web Development", Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass, Wrox,2005
- 2."Beginning PHP5 (Programmer To Programmer) (Paperback)", Dan Squier, David Mercer , Allan Kent, Steven Nowicki, Clark Morgan, WankyuChoi,Wrox,2004
- 3."Learning PHP, Mysql and Java Script With Jquery, CSS and HTML5" By Robin Nixon,

**Reference Books:**

1. "Core PHP Programming" By Atkinson Leon, SuraskiZeev, Pearson Publication

## MCA Semester-III

### Core Java

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Prerequisites

Fundamentals of Programming

### Course Learning Outcomes

After successful completion of the course, student will be able to:

- develop object oriented GUI software using java programming language
- develop multi threaded applications
- demonstrate data persistence with files and databases
- apply exception handling mechanism for robust software development
- develop network based programs

### Syllabus

#### Java Programming Environment

Brief History of Java, Salient Features, Java Development Kit, Command-Line Tools, Building and Running Programs



#### Overview of Object Oriented Concepts and Programming Structures

Object, Class, Encapsulation, Abstraction, Inheritance, Polymorphism

Data Types, Variables and Constants, Operators, String & String Buffer, Input & Output, Control Flow, Array, Conversion, Static Field, Static Method, Constructor, Package, Documentation Comments

#### Inheritance, Interface and Inner Classes

Introduction, Super Class, Subclasses, Object– The Universal Super Class, Wrapper Classes, Reflection, Enumeration Classes, Interface, Concrete Interface Methods, Dynamic Polymorphism Using Interface, Object Cloning, Inner Classes

Collection Classes: Array list, List, Hash Map, Sorted Map, Linked List, Hash Set, Sorted Set

#### Exception Handling and Multithreading

Classification of Exceptions, Exception Handling Techniques, User Defined Exception, The finally Keyword, Introduction to Multithreading, Thread Basics, Thread States, Multithreading Using the Thread Class and Runnable Interface, Thread Synchronization

#### Building Applets, GUI Programming and Event Handling

Applets Basics, Building and Running Applets, Working with Graphics Class, Inter-Applet Communication, Introduction to AWT Component

Basics of Event Handling, The AWT Event Hierarchy, Semantics and Low-Level Events In AWT, Event Listeners

SWING Components: Layout Managers, JFrame, JApplet, JButton, JLabel, JTextField, JPasswordField, JTextArea, JScrollPane, JCheckBox, JRadioButton, JComboBox, JPanel, JSlider, JSpinner, JMenu, JMenuBar, JMenuItem, JDialog, JFileChooser

### **File Handling and Database Programming**

I/O Streams Classes, Data Streams, Text Streams, ZIP File Streams, String Tokenizer, Object Streams, JDBC Architecture, Basic JDBC Programming Concepts: CRUD Operations, Classes of java.sql

### **Network Programming**

Introduction to Client/Server Programming, Socket, Port, TCP/UDP Programming

### **Text Books:**

1. "CoreJava Volume I & II", Cays Horstmann, Gary Cornell (7<sup>th</sup> Edition), Pearson Education
2. "The Complete Reference JAVA2", Herbert Schildt (5<sup>th</sup> Edition), Tata McgrawHill

### **Reference Books:**

1. "Introduction To Java Programming", Y. Daniel Liang, Pearson Education
2. "Java 2 Programming Black Book", Steven Holzner, Dreamtech Press



## MCA Semester-III

### Introduction to Systems Programming

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Basic knowledge of computer hardware and software, Knowledge of C programming

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- explain role of various system software such as operating system, assembler, compiler, linker and loader
- describe process concept, thread concept, process scheduling and deadlock management
- explain memory partitioning techniques and virtual memory techniques
- summarize file organization and input/output techniques
- demonstrate process management, inter-process communication and file management using system calls

#### Syllabus

##### Computer System Overview, Operating System Overview

Basic Elements, Processor Registers, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory

Operating System: Introduction, Objectives, Functions, Evolution, Major Achievements, Characteristics of Modern Operating System

##### Process and Threads, Concurrency, Deadlock and Scheduling

Process Concept, Process States, Process Control, System Calls for Process Management (fork, waitpid, exec Family), Process Scheduling: Types and Algorithms, Introduction to Threads Principles of Concurrency, Semaphores, Monitors, Reader/Writer Problem, System Calls for Semaphore Management (semget, semctl, semop, fsync)

Deadlock: Introduction, Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection

##### Memory Management

Memory Management Requirements, Memory Partitioning, Paging, Segmentation, System Calls for Memory Management (shmget, shmat, shmdt, shmctl), Hardware and Control Structures, Operating System Software

##### Input/Output and File Management

Overview, Disk Scheduling, Redundant Array of Independent Disks

File Management Overview, File Organization and Access, System Calls for File Management  
(open, close, read, write, lseek, stat, mkdir, rmdir, link, unlink, dup, dup2, pipe)

### **Introduction to System Software**

Language Processor, Assembler, Compiler, Linker and Loaders

**Text Books:**

1. "Operating Systems : Internals and Design Principles", William Stalling, 6<sup>th</sup> Edition, Prentice Hall India
2. "System Programming and Operating System", D M Dhamdhere, 2<sup>nd</sup> Edition, Tata McGraw Hill Education Private Limited

**Reference Books:**

1. "Operating System Principles", Abraham Silberschatz, Peter B. Galvin and Greg Gagne, 9<sup>th</sup> Edition, Wiley-Indian
2. "Modern Operating Systems", A. S. Tanenbaum, 4<sup>th</sup> Edition, PHI
3. "System Software–An Introduction to System Programming", Leland L. Back, 3<sup>rd</sup> Edition, Pearson Education Asia
4. "System Programming", Srimanta Pal, Oxford University Press Prentice Hall India





## MCA Semester - III

### Agile Methodology And Python Programming

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Software Engineering Concepts, Programming Fundamentals, fundamentals of RDBMS

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- differentiate between waterfall model and agile approach
- understand agile fundamentals
- explain scrum methodology for software development
- develop basic programs with help of elements of python programming language

#### Syllabus

##### Introduction to Agile Approach

What is Agile?, History of Agile, Comparison of Waterfall Model With Agile Model, Agile Manifesto: Principles and Overview of Agile Project Management, Advantages and disadvantages  
Aspects of Agile Approaches: Agile Software Development Approaches (Scrum, Kanban, Extreme Programming, Feature Driven Development, Dynamic Driven Development), Collaborative User Story Creation, Retrospectives, Continuous Integration, Release and Iteration Planning

##### Scrum

Scrum Methodology, Characteristics of Scrum, Scrum Terminologies: Scrum Team (Product Owner, Scrum Master, Cross Functional Team), Sprint, User Story, Epics, Product Backlog, Sprint Backlog, Story Points, Burn Down Charts, Velocity, Time Boxing, Activities in Scrum: Planning Meeting, Execution of Sprint Tasks, Daily Stand Up, Review & Retrospective Meeting

##### Agility and Requirements Engineering

Impact of Agile Processes in Requirements Engineering, Current Agile Practices, Variance, Overview of Requirements Engineering Using Agile, Managing Unstable Requirements, Requirements Elicitation, Agile Requirements Abstraction Model, Requirements Management in Agile Environment, Agile Requirements Prioritization, Agile Requirements Modeling and Generation, Concurrency in Agile Requirements Generation

##### Agile Planning and Estimation

User Stories, Story Points, Whole Team Estimate Together, Task Boards, Burn Down Charts, Velocity, Story Maps Help to Prioritize Backlog, Retrospective to Improve Team Work, Techniques for Estimation: Estimates Shared, Estimation Scale, Derive Estimation, Planning Poker

## **Elements of Python Programming**

Basic Elements: Basic Data Types, Branching Statements, Iterations, Control Structures, 'input' Statement, 'print' Statement

## **Functions**

Passing Arguments to Functions, Anonymous Function, Scope of Variables, Global and Local Variables, Modules, Package File I/O

## **Structured Types**

String, List, Tuple, Dictionary, Set

## **Object Oriented Programming**

Class, Object, Inheritance

## **Interfacing with Database**

Connecting to Database, CRUD operations

## **Text Books:**

1. "Agile Project Management with Scrum", Ken Schwaber, Microsoft Press
2. "Head First Agile", Andrew Stellman & Jennifer Greene, O'Reileey
3. "User Stories Applied: For Agile Software", Mike Cohn, Addison Wesley
4. "Agile Estimating and Planning", Mike Kohn, Pearson Education
5. "Introduction to Computation and Programming Using Python", John V Guttag, 6 th Edition, Prentice Hall of India
6. "Core Python Programming", R. Nageswara Rao, dreamtech

## **Reference Books:**

1. "Scrum in Action: Agile Software Project Management and Development", Andrew Pham, Phuong-Van Pham, Course Technology PTR
2. "Fundamentals of Software Engineering", Rajib Mall, 4<sup>th</sup> Edition, PHI Learning
3. "Agile Software Development Methods, Review and Analysis", Pekk Abrahamsson, OutiSalo & JussiRonkainen
4. "Agile Software Development Ecosystems", Jim Highsmith, Addison Wesley
5. "Core Python Programming - Second Edition", Wesley J. Chun, Prentice Hall

## MCA Semester-III

### Cryptography and Network Security

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

#### Prerequisites

Fundamentals of Computer Networks and Mathematics

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- Summarize concepts of threat, vulnerability, attack and counter measure
- outline the principles of underlying cryptography and cryptanalysis
- describe encryption techniques including symmetric and asymmetric encryption, hashing, and digital signatures
- explain authentication protocols and requirements

#### Syllabus

##### Introduction

Computer Security Concepts, Security Attacks, Security Services, Security Mechanisms and Techniques, Model for Network Security

##### Cryptography, Message Confidentiality and Authentication

Symmetric Encryption: Principles, Symmetric Block Encryption Algorithms (Data Encryption Standard, Triple DES, Advanced Encryption Standard), Random and Pseudorandom Numbers, Stream Ciphers and RC4, Cipher Block Modes of Operation

Public Key Cryptography: Approaches to Message Authentication, Secure Hash Functions, Message Authentication Codes, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms (RSA and Diffie-Hellman Exchange), Digital Signatures

##### Key Distribution, User Authentication and Transport-Level Security

Symmetric Key Distribution Using Symmetric Encryption, Kerberos, Key Distribution Using Asymmetric Encryption, X.509, Certificates, Public-Key Infrastructure

Fundamentals of Web Security, Secure Socket Layer, Transport Layer Security, HTTPS, SSH

##### Wireless Network Security and Email Security

IEEE802.11 Wireless LAN Overview, IEEE802.11i Wireless LAN Security, Pretty Good Privacy, S/MIME

Fundamentals of IP Security, IP Security Policy, Encapsulating Security Payload, Combining Security Associations

##### System Security

Classes of Intruders and Intrusion Detection, Password Management, Types of Malicious Software, Viruses and Its Countermeasures, Worms, Distributed Denial of Service Attacks

Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall Location and Configurations 2018-2021 Batch

**Text Books:**

1. "Network Security Essentials-Applications and Standards", William Stallings, 4<sup>th</sup>Edition, Pearson Education
2. "Cryptography & Network Security", Behrouz A. Fourouzan(Special Indian Edition), Tata McGraw Hill

**Reference Books:**

- 1."Cryptography and Network Security- Principles and Practice", William Stallings, 6<sup>th</sup>Edition, Pearson Education



## MCA Semester-III

### Electronic Commerce

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

#### Prerequisites

Fundamentals of programming, internet

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- explain electronic-commerce and mobile-commerce ecosystem
- identify security aspects in e-commerce and mobile commerce world
- identify particular e-commerce model and business model for a given business scenario
- describe various web marketing & publishing approaches
- summarize payment gateways fore-commerce

#### Syllabus

##### Introduction

Electronic Commerce: Introduction, Traditional Approach and Electronic Commerce, Benefits, Impact, Classification, Applications

Business Models: Define Business Model, Native Content Models, Native Transaction Models, Transplanted Content Based Models, Transplanted Transaction Based Models

##### Electronic Data Interchange

Conventional Trading Process/ Non-EDI Systems, EDI Systems, Traditional EDI Systems, Building Blocks of EDI Systems: Layered Architecture, Value Added Networks, Partially Integrated EDI Systems, Fully Integrated EDI Systems, EDI Systems and The Internet, Benefits and Applications of EDI, Insight's Web Based Ordering System, Case Study: Indian Customs and Excise

##### Architectural Framework

Architectural Framework and Elements of Electronic Commerce– Network Infrastructure, Information Distribution Technology, Networked Multimedia Publishing Technology, Security and Encryption, Payment Services, Business Service Infrastructure, Public Policy and Legal Infrastructure Information

##### Internet Marketing

Online Publishing: Introduction, Strategies, Approaches, Success Examples, Digital Copyrights and Electronic Publishing, Importance of Search Engines, Organic and Sponsored Listing On Result Page, How Search Engine Works and Determines Results, Overview of WebSpiders and

Bots, [Draft](#) Links and Keywords, Types of Search Engines, Page Ranking and its Importance, Search Engine Marketing, Issues in Search Engine Optimization.

2018-2021 Batch  
Web Marketing: Introduction, Scope, Four P's of Marketing, Internet Marketing Techniques, Identifying Web Presence Goals, Internet Advertising, Models of Internet Advertising and its Types

### **Security in Electronic Commerce**

Information Vulnerability On Internet, Security Policy, Procedures and Practices, Site Security, Protecting the Network, Firewall, Securing the WebServices, Transaction Security, Cryptology, Basics of Cryptographic Algorithms and Authentication Protocols, Security Protocols of Web Commerce

### **Electronic Payment Systems**

Introduction to Payment Systems, Online Payment Systems, Introduction to Pre-Paid, Post-Paid and Modern Electronic Payment Systems, Requirements Metric of Payment Systems, SET Protocol, Online Credit Card Payments, Electronic Cash, Debit Cards at POS(Point of Sale)

### **Mobile Commerce**

Introduction, Benefits, Impediments, Framework

### **E-Commerce Case Study**

Case Study

### **Text Books:**

- 1."Electronic Commerce Framework, Technologies and Applications", Bharat Bhasker, 4<sup>th</sup> Edition, Tata McGraw Hill
- 2."Electronic Commerce– Security, Risk Management and Control", Marilyn Greenstein, Todd Fienmen, Tata McGraw Hill
- 3."Electronic Commerce –A Manager's Guide", Ravi Kalakota, Andrew B. Whinston, Pearson Education
- 4."E-Commerce Strategy- Text and Cases", Sanjay Mohapatra, Springer
- 5."A Complete Guide to Search Engine Optimization", Deepak Bansal, B. R. Publishing Corporation

### **Reference Books:**

- 1."E-Commerce", Kamlesh K Bajaj, Debjani Nag, Tata McGraw Hill Education
- 2."E-Marketing", Judy Strauss, Adel El-Ansary, Raymond Frost, 4<sup>th</sup> Edition, Pearson Prentice Hall
- 3."Electronic Commerce from Vision to Fulfillment", Elias M. Awad, 3<sup>rd</sup> Edition, Pearson Prentice Hall
- 4."Ecommerce A Managerial Perspective", P.T. Joseph, Prentice Hall India

## MCA Semester-III

### Cyber laws & Intellectual Property Rights

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

#### Prerequisites

Knowledge about of Usage of Modern ICT and their Security Aspects

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- identify cyber-crime and Indian act for cybercrime
- understand fundamentals of copyrights, trademark, patent and related ACT

#### Syllabus

##### Introduction to Cybercrime

Cybercrime Definition and Origins of the Word, Cybercrime and Information Security, Classification of Cybercrimes: Spamming, Email Spoofing, Cyber defamation, Internet Time Theft, Salami Attack, Data Diddling, Forgery, Web-Jacking, Industrial Spying, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Email Bombing, Password Sniffing, Credit Card Frauds, Network Intrusions, Identity Theft

Cybercrime Legal Perspective, Overview of Indian ITA2000, Global Perspective of Cybercrimes, Real Life Examples of Cybercrimes

##### Cybercrime: Mobile and Wireless Devices

Trends in Mobility, Popular Types of Attacks against 3G/4G Mobile Network, Credit Card Fraud, Types and Techniques of Credit Card Frauds, Types of Attacks on Mobile Phones: Mobile Phone Theft, Mobile Viruses, Mishing, Vishing, Smishing, Hacking Bluetooth

##### Cybercrime and Legal Perspectives

Cybercrime and The Legal Landscape Around the World, Need of Cyber Law-The Indian Context, Indian IT ACT 2000: Positive Aspect of ITA 2000, Weak Area of ITA 2000, Challenges to Indian Law and Cybercrime Scenario in India, Digital signature and Indian ITA: Public Key Certification, Representation of Digital Signature in ITA 2000, Impact of ITA 2000 in Digital Signature, Current Scenario of Digital Signature Under The ITA, Cryptographic Perspective on the Indian ITA, Amendments Made in the Indian IT Act: Changes Made to The Indian ITA, State Government Power Impacted by Amendment to The Indian ITA, Impact of Amendment of ITA in Information Technology

Cybercrime and punishment

##### Intellectual Property Rights

Introduction to Intellectual Property Rights, Property Rights in India, International Organizations and Agencies



Introduction to Patent: Meaning of Patent, Objective Behind a Patent Law, Procedure for Obtaining Patent: Overview of Steps for Obtaining Patent, Provisional and Complete Specification of Patent: Provisional specification, Complete Specification, Important Element of Complete Specification,

Rights on a Patent: Rights to Exploit the Patent, Right to License, Right to Assign, Right to Surrender the Patent, Right to Sue for Infringement, Transfer of Patent: Types of Assignment and Types of

### **Licence**

Infringement of Patent: Amount to Infringement, Use of Chemical Equivalence, Combination Claims, Doctrine of pith and marrow, Action for Infringement: Who Entitled Sue, Relief Available in Action for Infringement, Injunction, Patent Law in India: Patent Act of 1970

### **Copyright**

Introduction to Copyright: Meaning of Copyright, Characteristics of Copyright, Copyright Law in India-Copyright Act of 1957, Copyright Ownership Assignment/Licence: Nationality Required for Ownership of Copyrights, Ownership of Copyrights, Mode of Assignment, List Out Kind of Licence, Registration and Term of Copyright: Registration Steps, Different Terms of Copyrights, Copyright Infringement and Action Against Infringement : Direct-Indirect Copying, Conscious-Unconscious and Subconscious Copying  
Infringement of Musical Work and Artistic Work, Civil Remedies against Infringement

### **Trademark**

Introduction to Trademark, Trademark Property: Function of Trademark, Essentials of Trademark, Law of Trademark in India - Trademark Act of 1999, Registration and Authorities: Overview of Registration Steps-Submission of Application, Classification, Advertisement, Hearing of Parties, Duration of TradeMark, Removal and Restoration of Trademark, Prior User of Trademark  
Rights Conferred by Registration and Use of Trademark, Infringement to Trademark and Action against Infringement: Overview of Form of Infringement, Who can sue for Infringement, Types of Relief

### **Text Books:**

1. "Cyber Security, Understanding Cybercrimes, Computer Forensics and Legal Perspectives", Nina Godbole, Sunit Belapure, Wiley Publication
2. "Law Relating to Intellectual Property", Dr B. L. Wadhwa, 5th Edition, Universal Law Publishing Co New Delhi
3. "Law and Practice of Intellectual Property in India", Vikas Vashishth, 3rd Edition

### **Reference Books:**

1. "Intellectual Property", Debirag E Bouchoux, Cengage learning, New Delhi.
2. "Intellectual Property Rights", Prabhuddha Ganguli, TATA McGraw Hill, New Delhi
3. "Information Technology Law and Practices, Law and Emerging Technology, Cyber Law & Ecommerce", Vikul Sharma, Universal Law Publishing Co New Delhi

## MCA Semester-III

### Digital Forensics

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

#### Prerequisites

Fundamentals of Computer Network, Internet and Operating Systems

#### Course Learning Outcomes

After successful completion of the course, students will be able to:

- understand Importance of Computer Forensics as an Essential Part of Information Security
- summarize Incident Response Mechanism and Nature of Digital Forensic Evidences
- explain Fundamentals of Cybercrime, Network Forensics and Internet Forensics
- understand Searching of Data and Analysis of Disk and File System for Forensic Evidences

#### Syllabus

##### Introduction

Fundamentals and Historical Background of Cyber Forensics, Digital Forensic Science, Digital Evidences, Digital Forensics Life Cycle, Digital Forensics Process, The Phases In Computer Forensics, Computer Forensics Steganography, Relevance of OSI Layers In Computer Forensics Tools and Techniques for Digital Forensics

##### Cybercrime

Online Cyber Crimes, Web Spoofing and E-Mail Spoofing, Cyber Stalking, Web Defacement, Financial Crimes, ATM and Card Crimes, Spamming, Commercial Espionage and Commercial Extortion, Money Laundering, Fraud and Cheating

##### Network Forensics

Introduction, Capturing Network Traffic, Network Evidences, Deciphering TCP Header, Snort for Network Based Intrusion Detection System, Tools for Network Forensics

##### Internet Forensics

Layers of Network Abstractions, Internet Applications and Caveats, Tracing Information on the Internet, Forensics and Social Networking Sites

##### Disk and File System Analysis

Media Analysis Concepts, The Sleuth Kit, Partitioning and Disk Layouts, Special Containers, Hashing, Carving, Forensic Imaging, File Analysis (Audio, Video, Images, Documents), Windows System Artifacts, Linux System Artifacts, Internet Artifacts, Open Source Tools

#### Text Books:

1. "Digital Forensics With Open Source Tools", Cory Altheide, Harlan Carvey, Elsevier Syngress

2. "Digital Forensics", André Arnes, Jonn Wiley and Sons

3. "Digital Forensics For Network, Internet and Cloud Computing", Clint P Garrison, Elsevier Syngress

4. "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Nina Godbole, Sunit Belapure, Wiley

### **Reference Books:**

1. "Computer Forensics: Computer Crime Scene Investigation", John R. Vacca, Firewall Media

2. "Guide To Computer Forensics and Investigations", Nelson, Phillips Enfinger, Steuart, 4<sup>th</sup> Edition, Cengage Learning



## MCA Semester-IV

### Object Oriented System Development

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	-	60	40	-	25	125	4	0	4

#### Prerequisites

Software Development Life Cycle and Object Oriented Principles

#### Course Learning Outcomes

After Successful Completion of the Course, Student will be Able to:

- Summarize Importance of Object Oriented System Development Methodology and Unified Modeling Language
- Analyze the System using Object Oriented Methodology
- Design the System using UML Diagrams
- Demonstrate Use of UML Design Tool

#### Syllabus

##### Introduction

Overview of Object Oriented System Development: Introduction and significance of Object Oriented Methodology

Object Basics: Object Oriented Philosophy, Objects, Classes, Attributes, Object Behavior and Methods, Messages, Encapsulation and Information Hiding, Class Hierarchy, Polymorphism, Object Relationship and Association, Aggregation, Difference between Structure and Object Oriented Approach, Object Identity, Static and Dynamic Binding, Object Persistence, Meta Classes

Object Oriented System Development Life Cycle: Essence of Development Process, Software Development Process, Building High Quality Software, Object Oriented System Development: Object Oriented Analysis, Object Oriented Design, Implementation, Reusability

##### Object Oriented Methodologies

Object Oriented Methodology: Rumbaugh Object Modeling Technique, Booch Methodology, Jacobson Methodology, Design Patterns: Common Problems and Identify their Solution

Unified Approach: Object Oriented Analysis, Object Oriented Design, Incremental Development, Continuous Testing

##### Unified Modeling Language

##### Static and Dynamic Models, Introduction to Unified Modeling Language

Introduction of UML diagrams: Use-Case Diagram, Activity Diagram, Class Diagram, State Chart Diagram, Sequence Diagram, Collaboration Diagram, Package and Model Organization,

## **Object Oriented Analysis**

Use-Case Modeling: Use-Case Components, Uses and Extends Associations, Identify Actors, Guideline for Finding Use-Case, Naming Use-Case, Divide Use-Cases into Packages, Use-Case Scenario

Activity Modeling: Identify Activities, Branches, Initiation and Termination, Concurrent

Activities, Activity Diagram

Class Modeling: Noun Phrase Approach and Common Class Pattern Approach for Identify Classes, Associations, Super-Subclass Relationships, A-part-of Relationship- Aggregation, Define Attributes, Define Methods and Messages

Interaction Modeling: Guidelines for Constructing Sequence Diagram, Sequence Diagram Components, Sequence Diagram, Collaboration Diagram Components, Collaboration Diagram Case Study

## **Object Oriented Design**

Object Oriented Design Process and Design Axioms: Object Oriented Design Process Steps, Object Oriented Design Axioms and Corollaries

Designing Classes:

Refine Class Diagram: Object Oriented Design Philosophy, UML Constraint Language, Class Designing Process, Class Visibility, Refine Attributes, Design Methods and Protocols, Packages and Managing Classes

Access Layer-Object Storage and Objects: Object Store and Persistence Overview, Database Management System Overview, Object Oriented Database Management System, Object-Relational System Mapping, Multi-database System, Access Layer Class Design Process, Design Access Layer Classes

View Layer-Design Interface Classes: Identify View Layer Classes and Related Events, Prototyping User Interface, Design View Layer Classes

Case Study

Impact of Object Orientation on Testing

## **Rumbaugh Methodology**

Class Modeling: Object and Classes, Link and Associations, Advanced Link and Association, Generalization and Inheritance

Advanced Object Modeling: Aggregation, Abstract Classes, Generalization as Extension and Restriction, Multiple Inheritance, Metadata, Constraints

State Modeling: Events and States, Transition and Condition, State diagram, State diagram Behavior

Advanced State Modeling: Nested State Diagrams, Nested State, Concurrency Case Study

## **Case Study**

Construct UML Diagrams Using UML Designing Tool

## **Text Books:**

- 1."Object Oriented System Developments using the Unified Modeling Language", Ali Bahrami, McGraw Hill
- 2."Object Oriented Modeling and Design with UML", James Rumbaugh, Michel Blaha,

**Reference Books:**

1. "The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, ISBN: 9788177583724, Pearson Education
2. "UML Distilled", 3<sup>rd</sup> Edition, Martin Fowler, Pearson



3. "UML in a Nutshell ", Sinan Si Albir, O'reilly

## MCA Semester-IV

### Data Mining

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Fundamentals of Database Management System, Probability and Statistics

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- interpret the concept and characteristics of data mining, data warehousing and knowledge discovery
- use various data preprocessing techniques to clean and transform data sets
- apply data mining techniques systematically to solve societal problems

#### Syllabus

##### Data Mining: Introduction

Introduction and Goal, Mining Different Kinds of Data, Mining Different Kinds of Patterns, Data Mining Technologies, Data Mining Applications, and Data Mining Issues, Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Overview of Data Visualization

##### Data Preprocessing

Overview, Data Cleaning, Data Integration: Redundancy and Correlation Analysis, Data Reduction: Attribute Subset Selection, Regression and Log-Linear Models, Histograms, Clustering, Sampling, and Data Cube Aggregation, Data Transformation and Data Discretization: Overview, Normalization, Binning, Histogram Analysis, Cluster, Decision Tree and Correlation Analyses, Concept Hierarchy Generation for Nominal data

##### Data Warehousing: Introduction

Overview of Data Warehouse, OLTP and OLAP, A Multi tiered Architecture, Data Warehouse Models, Data Cube, OLAP Operations Overview

##### Mining Frequent Patterns, Association and Correlation

Basic Concepts: Market Basket Analysis, Frequent Item-Sets, Closed Item-Sets, and Association Rules, Frequent Item Set Mining Methods: Apriori Algorithm, Improving the Efficiency of Apriori, Pattern-Growth Approach, Mining Closed and Max Patterns, Pattern Evaluation Methods

##### Classification & Prediction

Overview, Basic Concepts, Classification By Decision Tree Induction, Bayes Classification Methods: Bayes' Theorem, Naive Bayesian Classification, Rule-Based Classification: IF-THEN Rules for Classification, Rule Extraction from a Decision Tree, Rule Induction Using a Sequential Covering Algorithm, Model Evaluation and Selection: Metrics for Evaluating Classifier Performance, Advance Classification Methods: Lazy Learners, K-Nearest-Neighbour Classifiers

## **Cluster Analysis**

Overview, Requirements for Cluster Analysis, Overview of Basic Clustering Methods, Partitioning Methods: k-Means Algorithm, k-Medoids Algorithm, Overview of Hierarchical Methods, and Density-Based Methods: DBSCAN, Overview of Outlier Analysis

## **Overview of Other Data Mining Techniques**

Text Mining, Web Mining, Multimedia Mining, Sequence Mining

### **Text Books:**

1. "Data Mining–Concepts & Techniques", Jiawei Han & Micheline Kamber, 2<sup>nd</sup> edition, Morgan Kaufmann Publishers
2. "Introduction to Data Mining with CASE STUDIES", G. K. Gupta, 3<sup>rd</sup> edition, PHI

### **Reference Books:**

1. "Data Mining and Analysis: Fundamental Concepts and Algorithms", Mohammed J. Zaki & Wagner Meira Jr.
2. "Introduction to Data Mining", Pang Ning Tan, Michael Steinbach, Anuj Krpatne, Vipin Kumar, 2<sup>nd</sup> Edition, Pearson





## MCA Semester-IV

### Advanced Java

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Object Oriented Programming, Core Java, Basic Knowledge of HTML

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- understand components of advanced java technology: servlet, JSP and Java Bean
- work with web containers
- develop & deploy database driven multitier enterprise applications using J2EE
- develop applications using various advanced java frameworks and webservice

#### Syllabus

##### Introduction to J2EE Technology

Introduction to J2EE Platform, Challenges and Requirements for Enterprise Application Development, Introduction to Enterprise Architecture Styles, J2EE Container Architecture, J2EE Server and Containers, J2EEArchitecture

##### Java Servlets

Introduction to Java Servlet, Servlet Lifecycle, Servlet Implementation, Servlet Configuration, Servlet Exceptions, Requests & Responses, Servlet Sessions, Servlet Context & Collaboration

##### Java Server Pages and JavaBeans

Introduction, JSP Directives, Scripting Elements, Introduction to Java Beans, Standard JSP Actions, JSP Implicit Objects, Expression Language, JSP Tag Extensions, Integrating JSPTL into JSP Pages, Introduction to XML and XML Usage

##### Web Services – Restful

Define REST, Restful Architecture, Restful Clients, Restful Web Service Design, Introduction to JAX-RS and Implementation with JAX-RS – Jersey, Implementation with RestEasy – JAX – RS, Securing Web Service (Via Custom Token Authentication, HTTP Basic Authentication and Oauth), Performance

##### Java Hibernate

Introduction to Object-Relational Mapping, Java Hibernate, Hibernate Architecture, Hibernate Object Life Cycle, Hibernate Configuration File and Mapping Files, Session Operations, Hibernate Strategies, Mapping of Relations, Fetching Strategies Overview, Querying Using HQL

## Java Spring

Introduction to Spring, Introduction to Aspect-Oriented Programming, Configuring Spring Development Environment and Setting A MVC Project, Bean Wiring, Advanced Container

Concepts, Introduction to Spring AOP Framework, Using JDBC with Spring and DAO Support, Introduction to Spring Boot, Spring Boot Features

### **Text Books:**

1. "Professional Java Server Programming J2EEv1.3vEdition", SubrahmanyavAllamaraju, Cedric Buest, Daniel O'Connor Et Al. Apress Publications
2. "Restful Java Web Services", Jose Sandoval, Packt Publication
3. "Hibernate in Action", Christian Bauer, Gavin King, Manning
4. "Spring MVC Beginner's Guide", Amuthhan Ganeshan, Packt Publication
5. "Spring in Action ", 2<sup>nd</sup> Edition, Craig Walls, Ryan Breidenbach, Manning- Dreamtech Press
6. "Learning Spring Boot 2.0", Second Edition, Greg L. Turnquist, Packt Publication

### **Reference Books:**

1. "Professional Java or Web Applications", Nicholas S. Willams, Wrox Publications
2. "Professional Java Server Programming J2EE Edition", Daniel O'Connor, Gordon Van Huizen, Jason Diamond Et Al. Wrox Publications
3. "Sams Teach Yourself J2EE in 21Days", Martin Bond, Dan Haywood and Others.
4. "Beginning Java EE6 With Glassfish3", Second Edition, Antonio Goncalves, Apress
5. "J2EE: The Complete Reference", Tata McGraw Hill
6. "Head First Servlet and JSP", Bryan Basham, Kathy Sierra, Bert Bates, O'Reilly Publication
7. "Professional Java Development with Spring Framework", Rod Johnson, Juergen Hoeyer, Alef Arendsen, Thomas Risberg, Colin Sampaleanu, Wrox Publication



## MCA Semester-IVII

### Enterprise Content Management

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Fundamentals of Database Management System

#### Course Learning Outcomes

After successful completion of the course, students will be able to:

- analyze requirements for business data management
- write database-queries to store, retrieve and manage digital data
- implement security methods to preserve digital data

#### Syllabus

##### Introduction

Defining Data, Information and Content: Content is Information Plus Data

Content Has Format, Structure and Functionality: Storage Format, Rendering Format, Categorizing Formatting [Formatting for Effect, Method, and Scope]

Introduction to Digital Platforms: Enterprise Digital Ecosystem, Concepts of Enterprise Content Management, Enterprise Digital Strategy and Content Strategy, Prerequisites for Content Strategy

##### Enterprise Content Management Business Guide

Content Lifecycle: Enterprise Content Management Acquisition, Storage, and Delivery

Content Maturity Models: The Five Stages of the Content Maturity Model, Dimensions of the Content Maturity Model

##### Enterprise Content Management Technical Guide

Content Management System Design and Architecture and Implementation Approach, Modern Content Management System Architecture Patterns [MVC Architecture, N-Tier Architecture and N-Layer Architecture, Service-Oriented Architecture, Microservices Architecture], Design Principles, Design of Content Management System Solution Components [Multi-Site Management Design, Content Folder Design, Content URL Design, Localization Design, Collaboration Design]

Development Using Templates and Workflows: Template Design, Authoring Content Using Templates

Transformation: Organization Content and Exchange Frameworks, Create a Content and Information Strategy, Advantages of Transformation Planning

Future Trends: Collaborative Technologies, Semantics Structures, Attribute Acquisition, Business Intelligence, Cloud Storage and SaaS

## **Advanced Content Management**

Content Integration and Content Standards: Content Integration Requirements, Content Management System Integration [Security Integration, Translation System Integration, Content

Service Integration, Portal Integration, Presentation Engine Integration, Metadata Management System Integration, Feed Integration, Digital Asset Management Integration, JCR-Based Integration]

Digital Asset Management and Document Management: Definition, Objectives and Trends

Content Migration: Content Migration Drivers, Principles and Design

Content Governance: Content Validation, Content-Testing Checklist, Content Analytics, Content SEO, Content Management System Evaluation Framework

Content Security: Content Security Vulnerability and Mitigation Steps, Generic Content Security Scenarios, Security Testing, Security Best Practices

Content Infrastructure and Performance Optimization

## **Enterprise Search Technologies**

Enterprise Search: Introduction, Capabilities and Features

Introduction to Advanced Enterprise Search: Relevancy Rank Adjustment and Rank Boosting, Alternative Search Suggestion, Secured Search, Key Elements of Semantic Search, Enterprise Semantic Search Process and Architecture, People Search and Social Search, Mobile Search, Big Data Search

## **Text Books:**

1. "Enterprise Content and Search Management for Building Digital Platforms", Shailesh Kumar Shivakumar, Wiley Pub
2. "Enterprise Content Management A Business & Technical Guide", Stephen A. Cameron, BCS Learning & Development Limited



## **Reference Books:**

1. "Managing Enterprise Content: Aunified Content Strategy", Ann Rockley Charles Cooper
2. "Content Management Bible", Bob Boiko

## MCA Semester-IV

### Cloud Computing

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Fundamentals of Computer Networks, Operating Systems and Internet Technologies

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- understand cloud computing ecosystem and cloud service models
- describe containerization and its significance
- understand devOps practices
- develop and deploy cloud based applications and work with public clouds

#### Syllabus

##### Introduction, Architecture and Service Models

Defining Cloud Computing, Cloud Types, Characteristics Of Cloud Computing, The Role of Open Standards, Cloud Computing Stack and Cloud Architecture, Cloud Computing Service Models (IaaS, SaaS, PaaS, IDaaS, VaaS)



##### Virtualization

Using Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Virtual Machine Types, Oracle Virtual box

##### Container, Docker and DevOps

Understanding Docker Container, Advantage of Container over Virtual Machine, Container Orchestration, Docker Swarm, Kubernetes

Docker and DevOps: Continuous Integration, Continuous Delivery, The Need for CI/CD, Running Jenkins Master within Docker Container

##### Public Cloud

Amazon Web Services, Overview of AWS Components and Services, Elastic Compute Cloud (EC2), Amazon Storage Systems: Amazon Simple Storage Systems (S3), Amazon Elastic Block Store (EBS), Cloud front

Understanding Amazon Database Services: Amazon Simpledb, Amazon Relational Database Service (RDS), Introduction to Serverless Architecture

Microsoft Cloud Services: Windows Azure Platform, Azure Service, Azure Content Delivery Network, SQL Azure, Windows Live Services

##### OpenStack

OpenStack Components, Keystone, Identity Service, Nova-OpenStack Compute, Swift-





## **Cloud Security**

Security in Cloud: Securing the Cloud, Securing Data, Establishing Identity and Presence, Docker and Security

### **Text Books:**

1. "Cloud Computing Bible", Barrie Sosinsky, Wiley Publishing Inc.
2. "OpenStack Cloud Computing Cookbook", Kevin Jackson, Cody Bunch, Egle Sigler, 3<sup>rd</sup> Edition, Packt Publishing
3. "DockerIn Practice", Ian Miell, Aidan Hobson Sayers, Manning

### **Reference Books:**

1. "Cloud Computing Concepts Technology and Architecture", Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, Prentice Hall
2. "Cloud Computing Implementation, Management and Security", John Ritting house, James Ransome, CRC Press, Taylor and Francis Group
3. "Cloud Computing A Practical Approach", Anthony Velte, Tony Velte, Robert Elsenpeter, McGraw Hill



## MCA Semester-IV

### Advanced Web Development

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

HTML, CSS, Java Script, PHP/ ASP .NET

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- understand fundamental concepts & components of internet & web development
- develop interactive websites using latest front end development tools and technology
- design & create web pages with standard user interface using various client side scripting libraries

#### Syllabus

##### Introduction to JQuery

What Is JQuery and How It Works, Adding JQuery Code to HTML Page, Java Script and JQuery, Development Tools (Web Inspector)



##### JQuery Elements & Events

The Document Object Model, \$() Function, CSS Selectors, Custom Selectors, DOM Traversal– Styling Specific Cells and Chaining, Accessing DOM Elements, Page Load Events – Timing of Code Execution – Multiple Scripts on Single Page – Code Brevity – Argument Passing to . Ready() Callback, Simple Events– Style Switcher–Enabling Buttons–Event Handler Context– Shorthand Events, Compound Events, Event Object– Event Targets – Stopping Event Propagation – Default Actions – Event Delegation and its Methods, Remove Event Handler – Event Namespacing– Rebinding Events, Simulating user Interaction–Keyboard Events

##### Styles, Animation & DOM Manipulation

Inline CSS Modification, Basic Hide & Show, Effects & Speed, Custom Animations, Simultaneous and Queued Effects, Attribute Manipulation, DOM Tree Manipulation, Copying Elements, Content Getter & Setters

##### Introduction to CSS & Bootstrap Framework

CSS Basics, CSS Selector, Box Model, The Viewport, Bootstrap 4 Introduction

##### Structure & Typography of the Bootstrap Page

HTML5 Doctype, View Area, Grid System Headings, Text & Text Elements, Lists, Tables

## **Bootstrap Components**

Structure of Bootstrap Form, Input Elements, Buttons, Dropdown Menus, Toolbars, Menu Buttons, Navigation, Page Headers, Progress Bar, Media, Lists, Cards, Modal Dialogs, Tabs, Tooltips, Popover, Alerts, Carousel

## **Node.js Overview**

Introduction, Loading Modules, Using Buffers, Using Event Emitter, Making a Simple Web Application using Express.js

## **Angular.js Overview**

Introduction, Angular CLI, Angular Components, Master Details Component, Service & Routing, Simulating HTTP Server

## **Vue.js Overview**

Introduction, Declarative Rendering, Conditionals and Loops, Handling User Input, Composing with Components

## **Text Books:**

1. "Learning JQuery", 3<sup>rd</sup> Edition, Jonathan Chaffer, Karl Swedberg, Packt Publishing
2. "Introducing Bootstrap 4", Jörg Krause, Apress
3. "Professional Node.js: Building Javascript Based Scalable Software", Pedro Teixeira, Wiley Publication
4. "Learning Angular", 2<sup>nd</sup> Edition, Christoffernoring, Pablo Deeleman, Packt Publishing
5. "Learning Vue.js 2", Olga Filipova, Packt Publishing

## **References:**

1. <https://angular.io/tutorial/>
2. <https://vuejs.org/v2/guide/>
3. <https://www.w3schools.com/jquery/>
4. <https://www.tutorialspoint.com/nodejs/>



## MCA Semester-IV

### Advanced Programming Technique-II

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Basic Understanding of Object Oriented Programming and HTML

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- understand .NET framework architecture and features
- develop database driven ASP.NET dynamic web applications and windows applications using C# language and .NET frame work controls
- develop multithreaded applications and event delegation model
- demonstrate use of AJAX controls, XML and XML schema definition in .NET applications
- demonstrate MVC based applications using C#

#### Syllabus

##### An Introduction to .NET Framework

The Evolution of Web Development: Active Server Page(ASP) .NET, Server Side and Client Side Programming

The .NET Framework: CLR,.NET Class Library, Features of Visual Studio .NET

##### Programming in C#

Variables, Data Types, Flow Control, Enumeration, Arrays, Namespaces, main() Method, Compiling C# File, Console I/O, Comments, Rules For Identifiers, Class Members

Inheritance: Types, Implementation, Abstract Class, Sealed Class, Modifiers, Interfaces, Operators, Type Safety, Comparing Objects for Equality, User-Defined Casts

Advanced C#: Memory Management, Freeing Unmanaged Resources, Unsafe Code, String Class, Error and Exception Handling, Delegates and Events

##### Windows Programming

Creating Windows Form Applications, Control Class, Size and Location, Appearance, User Interaction, Windows Functionality, Class Hierarchy

Standard Controls and Components: Button, CheckBox, ComboBox, ListBox, DateTimePicker, Error Provider, Help Provider, ImageList, Label, ListView, Panel, PictureBox, ProgressBar, Radio Button, TextBox, RichTextBox, Splitter, StatusBar, TabControl, TabPages, Menu, ToolBar, Form Class

##### Introduction to ASP.NET, Web Controls, Events and State Management

Creating Website Using Visual Studio, Designing A Web Page, Anatomy of Web Form, Debugging, Anatomy of ASP.NET Application, Introduction of Server Controls, Page Class, Configuring ASP.NET Application, Basic Web Control Classes, Web Control Tags, Web control

**Draft** Base Class, The Default Button, List Controls, Web Control Events, Auto PostBack, Page Life Cycle, Validation Controls, Calendar and AdRotator Control **2018-2021 Batch**

State Management: View State, Transferring Information between Pages, Cookies, Session State, Configure Session, Application State, Comparison of State Management Options

### **ADO.NET and Data Bound Controls**

Configure Database, Basic SQL in Visual Studio, Data Provider Model, Direct Data Access, Disconnected Data Access

Data Binding: Single Value Databind, Repeated Value Data Bind, Working with Data Source Controls, GridView, DetailsView, FormView

### **XML and AJAX**

XML Basics, Attributes, Comments, XML Display and Transform XML Web Controls, Introduction to AJAX, Script Manager, Update Panel, ProgressBar, Timer

### **ASP.NET MVC (Model View Controller)**

History of MVC, Principles, MVC Pattern Flow, Advantages of MVC, Web Forms and MVC in ASP.NET, Programming Model, Main Elements, Relation between ASP.NET, ASP.NET Web Forms and ASP.NET MVC, Implementation of MVC in ASP.NET, ASP.NET MVC Project, Examining the Solution Structure, Test Projects, Demonstration of MVC in ASP.NET

### **Text Books:**

1. "Professional C#", 3<sup>rd</sup> Edition, Robinson, Nagel, Watson, Glynn, Skinner, Evjen, Wrox-Wiley Publication
2. "Beginning ASP.NET 4.5 In C#", Matthew Macdonald, APRESS
3. "Beginning ASP.NET MVC1.0", Chiaretta & Nayyeri, Wrox-Wiley Publication

### **Reference Books:**

1. "Professional ASP.NET 4 In C# And VB", Evjen, Wrox-Wiley Publication
2. "Professional ASP.NET 3.5 In C# 2008", Matthew Macdonald, APRESS

## MCA Semester-IV

### Advanced Database Management Systems

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Fundamentals of Database Management System, Structured Query Language, Object Oriented Programming

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- interpret the impact of various types of emerging databases
- understand query processing and query optimization, database related standards
- explain database security issues with its preventive measures
- perform PL/SQL programming

#### Syllabus

##### Query Processing and Query Optimization

Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions

Query Optimization: Overview, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views

##### Parallel Databases and Distributed Databases

Database-System Architecture, Parallel Databases: Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems, Parallelism on Multicore Processors Distributed databases : Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing, Heterogeneous Distributed Databases, Cloud-Based Databases, Directory Systems

##### Object-Based Databases and XML

Object-Based Databases : Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational

XML: XML Hierarchical Data Model, XML Documents, DTD(Document Type Definition),XML schema, Storing and Extracting XML Documents from Databases, XML Languages, Extracting XML Documents from Relational Databases

##### Spatial & Temporal Data and Mobility

Motivation, Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility





## NoSQL

Overview of NoSQL: Defining NoSQL, Need of NoSQL, List of NoSQL Databases, Characteristics of NoSQL: Application, RDBMS approach, Challenges, NoSQL Approach, NoSQL Storage Types: Comparing the Models, Advantages and Drawbacks, Case Study using MongoDB

## Database Security

Introduction to Database Security Issues, Discretionary Access Control Based on Granting and Revoking Privileges, Mandatory Access Control and Role-Based Access Control for Multilevel Security, SQL injection, Introduction to Statistical Database Security

## Text Books:

1. "Database System Concepts", Silberschatz, Korth, Sudarshan, 6<sup>th</sup> Edition, McGraw Hill International Edition
2. "Fundamentals of Database Systems", Ramesh Elmasari, Shamkant B. Navathe, 6<sup>th</sup> Edition, Pearson Education
3. "Getting Started with NoSQL", Gaurav Vaish, Packt Publishing

## References:

1. "Oracle Database 11g The Complete Reference", Kevin Loney, McGraw Hill Ora Press
2. <http://www.mongodb.com>
3. "MongoDB in Action", Kyle Banker, Piter Bakkum, Shaun Verch, Dreamtech Press



## MCA Semester-IV

### Analysis and Design of Algorithm

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Programming Fundamentals, Data Structures

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- summarize importance of algorithm, complexity of algorithm and asymptotic notations
- analyze algorithms by estimating their complexity
- design and implement algorithms using suitable problem solving techniques
- understand basics of P, NP and NP-complete problems

#### Syllabus

##### Fundamentals of Mathematics and Data Structures

Fundamentals of Mathematics : Role of Algorithms in Computing, Mathematics for Algorithmic Sets, Data Structures: Array, Stack and Queue, Pointers, Linked List, Graph, Tree, Associative Table



##### Analysis of Algorithm

The Efficient Algorithm, Average, Best and Worst Case Analysis, Elementary Operation, Asymptotic Notations, A Notation for "The Order Of", Analyzing Control Structures: Loop Statements, Recursive Calls, Correctness of Algorithms, Sorting Algorithms and Analysis: Bubble Sort, Selection Sort, Amortized Analysis

##### Divide and Conquer Algorithm

Introduction, Recurrence and Different Methods to Solve Recurrence, Multiplying Large Integers Problem, Problem Solving using Divide and Conquer Algorithm - Binary Search, Max- Min Problem, Matrix Multiplication

##### Exploring Graphs

Types of Graphs: Undirected, Unidirectional, Bidirectional Graphs, Traversing Graphs, Graph Search: Depth First Search and Breadth First Search

##### Greedy Approach

Greedy Algorithm: Introduction and Characteristics, Spanning Tree, Minimum Spanning Tree: Kruskal's Algorithm, Prim's Algorithm, Shortest Path Algorithm

##### Dynamic Programming

Introduction, The Optimality Principle, Problem Solving using Dynamic Programming: All Points Shortest Path, Matrix Chain Multiplication, Longest Common Subsequence, Knapsack

Problem

## **Back Tracking**

Back Tracking: General Strategy, N-Queen's Problem, Traveling Salesman Problem

## **The NP Concept**

Basic Concepts: Non-Deterministic Algorithms, The Classes NP Hard and NPcomplete

## **Text Books:**

1. "Introduction to Algorithms", Thomas Cormen, Charles Leiserson, Ronald Rivest, Clifford Stein, 3<sup>rd</sup> Edition, PHI
2. "Fundamentals of Algorithmics", Gilles Brassard, Paul Bratley, PHI
3. "Computer Algorithms", Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Computer Science Press

## **Reference Books:**

1. "Design and Analysis of Algorithms", Prabhakar Gupta, Vineet Agarwal, Manish Varshney, PHI
2. "Design and Analysis of Algorithms", Parag Dave, Himanshu Dave, 2<sup>nd</sup> Edition, Pearson Education



## MCA Semester-IV Information Retrieval

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Prerequisites

Java Language, Data Structures, Probability and Statistics

### Course Learning Outcomes

After successful completion of the course, students will be able to:

- apply information retrieval models
- use link analysis
- use of ontology and cross-lingual information retrieval

### Syllabus

#### Introduction

History and Components of Information Retrieval, Issues, Open Source Search Engine Frameworks, Impact of the Web on Information Retrieval, Role of Artificial Intelligence in Information Retrieval, Information Retrieval and Web Search, Components of a Search Engine, Characterizing the Web

#### Models of Information Retrieval

Boolean and Vector-Space Retrieval Models, Term Weighting, Term Frequency–Inverse Document Frequency Weighting, Cosine Similarity, Preprocessing, Inverted Indices, Efficient Processing with Sparse Vectors, Language Model Based Information Retrieval, Probabilistic Information Retrieval, Latent Semantic Indexing, Relevance Feedback and Query Expansion

#### Web Search Engine – Introduction and Crawling

Web Search Overview, Web Structure, Paid Placement Retrieval, Search Engine Optimization/Spam, Web Size Measurement, Crawling, Meta-Crawlers, Focused Crawling, Web Indexes, Near-Duplicate Detection, Index Compression, XML Retrieval

#### Web Search – Link Analysis and Specialized Search

Link Analysis, Hubs and Authorities, Page Rank and HITS Algorithms, Searching and Ranking, Relevance Scoring and Ranking for Web, Personalized Search, Collaborative Filtering and Content-Based Recommendation of Documents and Products, Handling “Invisible” Web, Snippet Generation, Summarization, Question Answering, Cross-Lingual Retrieval

#### Retrieval Performance Evaluation and Ontology

Draft

Performance Evaluation: Precision and Recall, Alternative Measures

Ontology: Introduction, Elements of Ontology, Synonyms and Homonyms, Web Ontology Language(OWL),Ontology Based Information Sharing, Ontology Languages for Semantic Web, Ontology Creation

### **Distributed and Multimedia Information Retrieval**

Distributed Information Retrieval: Introduction, Collection Partitioning, Source Selection, Query Processing, Web Issues

Multimedia Information Retrieval: Introduction, Data Modeling, Query Languages, Generic Multimedia Indexing Approach, One Dimensional Time Series, Two Dimensional Color Images, Automatic Feature Extraction

### **Text Books:**

- 1." Introduction to Information Retrieval", C. Manning, P. Raghavan, and H. Schütze Cambridge University Press,2008
- 2."Modern Information Retrieval: The Concepts and Technology Behind Search", Ricardo Baeza-Yates and Berthier Ribeiro - Neto, 2<sup>nd</sup> Edition, ACM Press Books

### **Reference Books:**

- 1."Search Engines: Information Retrieval in Practice", Bruce Croft, Donald Metzler and Trevor Strohman 1<sup>st</sup> Edition Addison Wesley, 2009
- 2."An Introduction to Search Engines and Web Navigation", Mark Levene 2<sup>nd</sup> Edition Wiley, 2010
- 3."Information Retrieval: Implementing and Evaluating Search Engines" Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, The MIT Press,2010
- 4."Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series", Ophir Frieder 2<sup>nd</sup> Edition, Springer,2004
- 5."Building Search Applications: Lucene, Ling Pipe", Manu Konchady, First Edition, Gate Mustru Publishing, 2008



## MCA Semester-IV

### Database Administration

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Relational Database Management Systems, SQL, basics of Operating Systems

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- use specific database software to store and organize data
- plan, install, and configure database management software
- manage migration, monitor performance and troubleshoot
- apply transaction management and concurrency control mechanisms
- implement security, backup and data recovery solutions

#### Syllabus

##### Introduction

Importance of Database Administration, the Discipline of Database Administration, Data-System-Database Administration, DBA Tasks, Types of DBAs, Staffing Considerations, Impact of Newer Technology on DBA, DBA Certification, and Characteristics of a DBA

##### Introduction to NoSQL and MongoDB

Introduction to NoSQL, Comparison with SQL, MongoDB Design Philosophy, SQL Comparison, MongoDB Data Model, Introduction to MongoDB Architecture, MongoDB Limitations

##### Database Change Management and Data Availability

Change Management Requirements-The DBA perspective, Types of Changes, Impact of Change on Database Structures, Database Change Scenarios, Requesting Database Changes

Database Availability, Increased Availability Requirements, Cost of Downtime, Availability Problems, Ensuring Availability: Maintenance, Automation, Clustering, Denormalization of Data

##### Performance Management

Defining Performance, The road Map, Monitoring and Management, Service-Level Management, Types of Performance Tuning, Performance Tuning Tools

Introduction to System Performance Management, Database Performance Management, Techniques for Optimizing Databases, Database Reorganization, Introduction to Application Performance Management

##### Database Security, Backup and Recovery

Data Breaches, Security Basics, Granting and Revoking Privileges, Security Reporting, Authorization roles and Groups, Using Views and Stored Procedures for Security, Other Security

Mechanisms, Auditing

Importance of Backup and Recovery, Backup Mechanisms, Recovery Mechanisms, Alternatives to Backup and Recovery

Need for Disaster Planning, General Disaster Recovery Guidelines, Backing up the Database for

Disaster Recovery, Disaster Prevention

### **Data Storage Management, Movement and Distribution**

Storage Management Basics, Files and Data Sets, Space Management, Fragmentation and Storage, Storage Options - Overview

Loading and Unloading of Data, Export and Import, Bulk Data Movement, Distributed Databases and Performance Problems

### **DBA Tools**

Types and Benefits of DBA Tools, Modeling and Design, Change Management, Table Editors, Performance Management, Backup and Recovery, Protection and Compliance, Data Warehousing, Analytics, Business Intelligence, Programming and Development, Miscellaneous Tools, Evaluating DBA Tool Vendors, Homegrown DBA Tools

### **Text Books:**

1. "Database Administration: The Complete Guide to DBA Practices and Procedures", (2<sup>nd</sup> Edition) by Craig S. Mullins, Addison-Wesley Publication
2. "Practical MongoDB" by Shakuntala Gupta Edwardand Navin Sabharwal, Apress Publication

### **Reference Books:**

1. "DBA Survivor" by Thomas LaRock, Apress Publication
2. "MongoDB: The Definitive Guide" by Kristina Chodorow, O'Reilly Publication



## MCA Semester-V

### Software Testing

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Fundamentals of Software Development Life Cycle (SDLC), Basic understanding of any programming language, DBMS and SQL concepts, Basic understanding of Agile Development

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- Design and Develop Test Plan and Test Specification
- Preparing and executing test cases
- Reporting and retesting bugs identified
- Use automated testing, debugging and tracking tools

#### Syllabus

##### Software Testing Terminology and Methodology

Introduction and Evolution of Software Testing, Software Testing Definitions, Comparison: Effective and Exhaustive Software Testing, Software Testing Process and Terminology, Software Testing Life Cycle (STLC), Software Testing Methodology

##### Verification and Validation

Verification and Validation (V&V) Activities, Verification, Verification of Requirements, Verification of High –level Design, Verification of Low –level Design, How to Verify Code?, Validation

##### Static Testing

Inspections, Structured Walkthroughs, Technical Reviews

##### Validation Activities

Unit Validation Testing, Integration Testing, Function Testing, System Testing, Acceptance Testing

##### Regression Testing

Progressive vs. Regressive Testing, Regression Testing Produces Quality Software, Regression Testability, Objectives of Regression Testing, When is Regression Testing Done? Regression Testing Types, Defining Regression Test Problem, Regression Testing Techniques

##### Test Management

Test Organization, Structure of Testing Group, Test Planning, Detailed Test Design and Test Specifications

##### Software Metrics

Need for Software Management, Definition of Software Metrics, Classification of Software Metrics Entities to be measured Size Metrics

##### Testing Metrics for Monitoring and Controlling the Testing Process

Measurement Objectives for Testing, Attributes and Corresponding Metrics in Software Testing,

Attributes Estimation Models for Estimating Testing Efforts, Architectural Design Metric Used for Testing Information Flow Metrics Used for Testing, Cyclomatic Complexity Measures for Testing, Function Point Metrics for Testing, Test Point Analysis (TPA), Some Testing Metrics

### **Testing Process Maturity Models**

Need for Test Process Maturity, Measurement and Improvement of a Test Process, Test Process Maturity Models

### **Automation and Testing Tools**

Why Automation? Barriers to Automation, An Agile Approach to Test Automation, What can We Automate? What we cannot Automate? Developing Automation Strategy, Evaluating Automation Tools, Implementing Automation, Managing Automated Tests

### **Testing Object Oriented Software**

Object-Oriented Testing (OOT) Basics, Comparison: Conventional testing and OOT, Issues in OOT, Issues in testing Inheritance, Various OO Testing Techniques

### **Using Agile Methods to Improve Software Testing**

Agile Values, What is Agile Testing? Context for Roles and Activities on Agile Team How is Agile Testing Different? Comparison: Traditional and Agile Testing, Whole-team Approach, Ten Principles for Agile Testers, The Agile Mindset, Applying Agile Principles and Values, Adding Value to the Business

### **Text Books:**

1. "Software Testing Principles and Practices", Naresh Chauhan, Oxford Publication
2. "Agile Testing, A Practical Guide for Testers and Agile Teams", Lisa Crispin and Janet Gragory, Addison-Wesley Publication

### **Reference Books:**

1. "Foundations of Software Testing ISTQB Certification" by Rax Black, Eric Van Veenendaal, Dorothy Greham, Cengage Learning

## MCA Semester-V

### Mobile Application Development

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Basic understanding of Java Programming, SQL, Database, XML, HTML, CSS and Java Script

#### Course Learning Outcomes

After successful completion of the course, Student will be able to:

- develop Native Mobile Applications using Android
- develop Hybrid Mobile Applications using Open Source Platform
- design and Develop Dynamic Mobile Applications with SQLite Database

#### Syllabus

##### **An Introduction to Mobile Application Development**

The Evolution of Mobile Application Development, Different Ecosystems: Apple, Google, Microsoft, Problems with Ecosystem-Based Applications, Web Sites and Web Views for Mobile Devices, Adding JavaScript, Hybrid Mobile Applications, Front-End and Back-End Development, Overview of Testing Mobile Applications, Native vs. Hybrid Mobile Applications

##### **Introduction to an Android Platform**

Overview of an Android Platform, Android SDK Features, Which Devices Android Runs on, Why Android for Mobile Development, Comparison of Android with Other Platform, Android Development Framework, Understanding Android Software Stack, Android Application Architecture

Installing and Updating Android SDK, Android Development Tools: AVD Manager, Android SDK Manager, Emulator, Dalvik Debug Monitor Service, Debug Bridge, Hierarchy View and Lint Tool, Monkey and Monkey Runner

##### **Development of an Android Applications, Activities and Intents**

Building Blocks of Android Application, The Application Manifest File, Manifest Editor, Creating Resources, Using Resources, Android Application Lifecycle, Application's Priority and It's Process States, Extending and using Android Application Class, Overriding the Application Lifecycle Events  
 Android Activities: Creating Activities, Activity Lifecycle, Activity Stacks, Activity States, Monitoring State Changes, Understanding Activity Lifetimes, Android Activity Classes

Overview of an Intent, Starting Activities, Sub Activities, and Services using Implicit and Explicit Intents

##### **Android UI Design Essentials**

Fundamental Android UI Design, Assigning UI to Activities, Layout Classes, Defining Layouts, Linear Layout, Relative Layout, Grid Layout, Optimizing Layouts  
 Fragments, Creating New Fragment, Fragment Life Cycle, Fragment Manager, Fragment Specific Lifecycle Events, Fragment States, Adding Fragments to Activities, Using Fragment Transaction,

Interfacing between Fragments and Activities, Fragment without User Interfaces, Android Fragment Classes

### **Android Views, Controls and Adapters**

Toolbox Controls, Creating and Modifying Views, Creating Compound Controls, Custom Views, Handling User Interaction Events, Custom Controls, Customizing Array Adapter and Simple Cursor Adapter

### **Android Databases and Content Provider**

Introduction to SQLite Database, Content Values and Cursors

Working with SQLite Databases: Opening and Creating Database without SQLite Open Helper, Querying Database, Extracting Values from a Cursor, Adding, Updating and Removing Rows, Creating Content Providers, Registering Content Provider, Publishing Content Provider's URI Address, Creating Content Providers Database and Implementing Its Queries, Content Provider Transaction, Adding, Deleting and Updating Content, Storing and Accessing Files from a Content Provider, Overview of Native Android Content Providers

### **Intent Filters and Broadcast Receiver**

Broadcasting Events with Intents, Introduction to Intent Filters and Broadcast Receiver Saving Simple Application Data: Shared Preferences, Saved Application UI State, Files

Creating, Saving and Retrieving Shared Preferences, Persisting the Application Instance State, Working with the File System

### **Location Based Services, Telephony and SMS API**

Overview of Location Based Services, Emulator with Location Based Services, Selecting a Location Provider, Finding Your Current Location

Hardware Support for Telephony, Initiating Phone Calls, Replacing Native Dialer, Accessing Telephony Properties and Phone State, Monitoring Changes in Phone State Using the Phone Listener, Using Intent Receiver to Monitor Incoming Calls

SMS and MMS, Sending SMS and MMS using Intents, Sending SMS using SMS Manager, Listening for Incoming SMS

### **Structure of Hybrid Mobile Applications Development**

iOS layer, Windows Phone Layer, Browser-Based Applications and Browser Runtime, How Hybrid Application Works

Basics of HTML 5 and Useful APIs: Integrated and Associated APIs

Data Formats: Using XML, JSON, JQuery Basics, JQuery Selectors, Server-Side Support

SOA Architecture: Web Services, WCF Services, Overview of REST Based Services, CSS, Bootstrap, Skeleton

HMAD Development and Packaging Frameworks, Testing Mobile Applications

### **Basics of UI for Hybrid Mobile Applications Development**

HTML with JQuery, Event Handling in JQuery, Live Event Binding in JQuery Using On Function, JQuery Plug-in-Based Approach to Generating a UI, Miscellaneous Libraries and Plugins, Responsive UI, Frequently Used Style Classes

### **File System, Storage, and Local Databases for Hybrid Mobile Applications Development**

Saving a File to Device Storage, Opening a Local File from Device Storage, Displaying the Contents of a Directory, Creating a Local SQLite Database, Uploading a File to a Remote Server via a POST

Request, Caching Content using the Web Storage Local Storage API

**Text Books:**

1. "Professional Android 4 Application Development", Reto Meier, Wrox (Willey) Publication
2. "Beginning Hybrid Mobile Application Development", Mahesh Panhale, Apress
3. "PhoneGap Mobile Application Development Cookbook", Matt Gifford, PACKT

**Reference Books:**

1. "Android Wireless Application Development Vol-I Android Essential", 3<sup>rd</sup> Edition, Lauren Dercey & Shane Conder, Pearson
2. "Android in action", Third Edition, W. Frank Ableson, RobiSen, Chris King, C. Enrique Ortiz, Dreamtech Press.

## MCA Semester - V

### Service Oriented Architecture

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Fundamentals of Web Application Development, XML

#### Course Learning Outcomes

After successful completion of the course, students will be able to:

- Understand the concepts of Service Oriented Architecture
- Understand primitive and Contemporary SOA
- Explain the integration of SOA with Web Services
- Develop web services using Java

#### Syllabus

##### Introduction

Fundamental SOA, Common Characteristics of Contemporary SOA, Benefits and Pitfalls of Adopting SOA, SOA Timeline (From XML to Web Services to SOA), The Continuing Evolution of SOA, Comparing SOA to Past Architectures



##### Web Services and Primitive SOA

The Web Services Framework, Service Roles, Service Models, Service Descriptions (with WSDL), Messaging (with SOAP)

##### Web Services and Contemporary SOA

Message Exchange Patterns, Service Activity, Coordination, Atomic Transactions, Business Activities, Orchestration, Choreography, Addressing, Reliable Messaging, Correlation, Policies, Metadata Exchange, Security, Notification and Eventing

##### Principles of Service Orientation

Anatomy of a Service Oriented Architecture, Common -Principle of Service Orientation, How Service-Oriented Principles Interrelate, Service-Oriented and Object-Oriented, Native Web Service Support for Service-Oriented Principles

##### SOA Platforms

SOA Platform Basics, SOA Support in J2EE, SOA Support in .NET, Integration Considerations

##### Developing SOA Applications using Java

Basic SOA using REST, XML Documents and Schema for EIS Records, REST Clients with and without JWS, REST Clients with and without JWS, SOA-Style Integration using XSLT and JAXP for Data Transformation, Introduction to JAX-WS 2.0, JAXB, WS-Metadata, RESTful Services with and without JWS

**Text Books:**

1. "Service Oriented Architecture- Concepts, Technology and Design", Thomas Erl, Pearson
2. "SOA Using Java Web Services", Mark D. Hansen, Prentice Hall
3. "Spring Boot in Action", Craig Walls, Manning

## Reference Books:

1. "SOA Principles of Service Design", Thomas Erl, Pearson
2. "Understanding SOA with Web Services", Eric Newcomer, Greg Lomow, Pearson
3. "RESTful Web Services" Leonard Richardson & Sam Ruby, O'Reilly

## MCA Semester-V Intelligent Systems

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Prerequisites

Fundamentals of Mathematics, Data Structures and Basics of Python

### Course Learning Outcomes

After successful completion of the course, student will be able to:

- analyze and apply various search techniques
- understand various knowledge representation methods
- solve AI problems through programming with Python

### Syllabus

#### Introduction

Introduction to Artificial Intelligence (AI), History of AI, What is Intelligence?, Significance of AI, Applications of AI

#### State Space Search

Generate and Test, Depth First Search, Breadth First Search, Comparison of BFS and DFS, Depth Bounded DFS, Depth First Iterative Deepening (DFID)

#### Informed (Heuristic) Search

Heuristic Functions, Best First Search, Hill Climbing, Local Maxima, Solution Space Search, Variable Neighbourhood Descent, Beam Search, Tabu Search

#### Randomized Search and Emergent Systems

Iterated Hill Climbing, Simulated Annealing, Genetic Algorithms, The Travelling Salesman problem, Emergent Systems, Ant Colony Optimization

#### Finding Optimal Paths

Brute Force, Branch and Bound, Dijkstra's Algorithm, A\* Algorithm, Admissibility of A\*, Iterative Deepening A\*(IDA\*), Recursive Best First Search (RBFS), Pruning the CLOSED List, Pruning the OPEN List

#### Problem Decomposition

Goal Trees, AO\* Algorithm, Rule Based Systems, Rete Algorithm

#### Adversarial Search Techniques (Game Playing)

MINIMAX Algorithm, Alpha-Beta Pruning, SSS\*

#### Planning and Constraint Satisfaction

The STRIPS Domains, Forward and Backward State Space Planning, Goal Stack Planning, Plan Space



Planning, Means Ends Analysis, Graph Plan, Constraint Satisfaction Problems, N-Queens Problem

### **Logic and Inferences**

Propositional Logic, Resolution Method in Propositional Logic, First Order Logic, Soundness and Completeness, Forward and Backward Chaining

### **Text Books:**

1. "A First Course in Artificial Intelligence", Deepak Khemani, McGraw Hill
2. "Artificial Intelligence", Elaine Rich and Kevin Knight, 3<sup>rd</sup> Edition, McGraw Hill

### **Reference Books:**

1. "Artificial Intelligence: A Modern Approach", Stuart Russell and Peter Norvig, 3<sup>rd</sup> Edition, Prentice Hall
2. "Artificial Intelligence with Python", Prateek Joshi, Packt Publishing

## MCA Semester-V

### Internet of Things

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Prerequisites

C Programming language, Fundamentals of digital logic & digital communication layers

### Course Learning Outcomes

After successful completion of the course, student will be able to:

- Understand Internet of Things Ecosystem and Design Blocks
- Understand Micro-Controller Based Architecture
- Develop Simple Arduino Boards Based Embedded Application

### Syllabus

#### Arduino Environment

Introduction to Arduino and Processing IDE Environment, Building Blocks of Arduino Program, C Storage Classes with respective scope and extent, EEPROM Memory Storage, Data Logging, Exploring Arduino Ecosystem, Using Arduino Libraries.

#### Working with Sensors using Arduino

Understanding Sensors, Digital I/O, Pulse Width Modulation, Reading Analog Sensors, USB and Serial Communication, Working with LEDs, Sound Sensors, DC Motor, Stepper Motor, Servo Motor, Temperature Sensor, Ultrasonic Sensor.

#### Introduction to Internet of Things

Understanding Internet of Things (IoT), Physical design in IoT, Things in IoT, IoT protocols, Logical Design of IoT, IoT Functional Blocks, Communication Models and APIs, IoT Enabling Technologies, IoT Levels and Deployment Templates, M2M, Difference between IoT and M2M, Introduction to SDN for IoT.

#### IoT Platforms Design Methodology and Case Study

Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device & Component Integration, Application Development Case Study on IoT System for Weather Monitoring.

#### Case Study Illustrating IoT Design

Home Automation: Smart Lighting. Environment: Weather Monitoring.

#### Text Books:

- 3 "Beginning C for Arduino", Jack Purdum, Apress Publications.
- 4 "Beginning Arduino", 2nd Edition, Michale McRoberts, Apress Publication.
- 5 "Internet of Things – A Hands on Approach", Arshdeep Bahga, Vijay Mediseti, VPT.

**Reference Books:**

5. "Getting Started with Arduino", Massimo Banzi, Michael Shilloh, O'Reilly, Third Edition
6. "Learning Internet of Things", Peter Waher, Packt Publications.
7. "The Internet of Things – Do it Yourself Projects with Arduino, Raspberry Pi and BeagleBone Black", Donald Norris, Tata McGraw-Hill Publications.
8. "Internet of Things Principles and Paradigm", Rajkumar Buyya, Amir Wahid Dastjerdi, Morgan Kaufman Publication Elsevier.
9. "Exploring Arduino – Tools, Techniques for Engineering Wizardry", Jeremy Blum, Wiley Publication.

## MCA Semester-V Game Programming

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Prerequisites

Object oriented programming using C#, JavaScript

### Course Learning Outcomes

- After successful completion of the course, student will be able to,
2. Work with materials, shaders, terrain, collision, lights and cameras
  3. understand gaming graphics and animations
  4. develop basic stand-alone game levels using Unity software

### Syllabus

#### Introduction to Unity and Game Objects

Introduction to components of Unity editor, Installation, Navigating the Unity Scene overview.

Game Objects: Dimensions and coordinate systems, Game objects, Transforms, Translation, Rotation, Scaling.

#### Models, Materials and Textures

Models, built-in 3D objects, importing models, asset store, Textures, Shaders, Materials.

#### Terrain

Terrain generation, Unity Terrain sculpting tools, Terrain textures.

#### Game environments

Adding trees and grass, Environment effects, Character controllers.

#### Lights and cameras

Lights: point lights, spotlights, directional lights, creating lights out of objects, Halos, Cookies

Cameras: Anatomy, multiple cameras, split screen and picture in picture

Layers: using layers.

#### Case Study - I

Amazing racer: Design, Requirements, Creating game world: sculpting world, adding environment, character controller; Gamification: adding game control objects, adding and connecting scripts; Playtesting.

#### Scripting

Introduction, Scripts: creating scripts, attaching scripts, basic script, variables, operators, conditional statements, Iteration. 2018-2021 Batch

Script methods: anatomy, writing and using methods, inputs and input scripting, specific key input, mouse input, accessing local components and other objects, modifying object components.

### **Collision**

Introduction, rigid bodies, collision, colliders, physics materials, triggers, raycasting.

### **Case Study - II**

Chaos Ball: Design, Concept, rules, requirements, Creating arena, Texturing, Super bouncy material, Working with game entities, Control objects.

### **Prefabs**

Introduction, Prefab terminology and structure, creating prefab, adding prefab instance to scene, inheritance, breaking prefabs, instantiating prefabs through code,

### **Graphical User Interfaces**

GUI basics and controls, GUI Customization, GUI Skin

### **Character Controllers**

Introduction, Adding character controller, Character controller properties, Scripting for character controllers, Building a Controller

### **Text Books:**

1. Sams Teach Yourself Unity Game Development, Mike Geig, Sams Publication

### **Reference Books:**

1. <http://unity3d.com/learn/tutorials/modules>
2. Unity in Action: Multiplatform Game Development in C#, Joseph Hocking, Manning

## MCA Semester-V Machine Learning

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Prerequisites

Fundamentals of data mining, Basic Python Programming

### Course Learning Outcomes

After successful completion of the course, student will be able to,

5. describe statistical methods in context of machine learning
6. apply basic classification and regression techniques
7. understand singular value decomposition

### Syllabus

#### Machine Learning Basics

A brief overview of Machine Learning, Key terminology and tasks of machine learning, How to choose right algorithm, Steps in developing machine learning application, Role of Python.

#### Classifying with k-Nearest Neighbors

Introduction, Classifying with distance measurements, General approach to kNN, Prepare data, Putting the kNN classification algorithm into action, How to test a classifier, Case study: improving matches from a dating site, Case study: handwriting recognition.

#### Classifying with Probability Theory: naive Bayes

Introduction, Classifying with Bayesian decision theory, Conditional probability, Classifying with conditional probability, Case Study: Document classification with naive Bayes, Classifying text with Python, Case Study: classifying spam email with naive Bayes.

#### Logistic Regression

Introduction, Classification with logistic regression and the sigmoid function, Using optimization to find the best regression coefficients, Case study: estimating horse fatalities from colic.

#### Predicting Numeric Values: Regression

Finding best-fit lines with linear regression, Locally weighted linear regression, Shrinking coefficients, The bias/variance tradeoff, Case study: forecasting toy price.

#### Tree based Regression

Introduction, Locally modeling complex data, Building trees with continuous and discrete features, Using CART for regression, Tree pruning, Model trees, Case study: Comparing tree methods to standard regression.

#### Singular Value Decomposition

Introduction to simplifying data with Singular Value Decomposition (SVD), Applications of

SVD, Matrix factorization, Implementation, Collaborative filtering - based recommendation engines, Case study.

**Text Books:**

1. "Machine Learning in Action" by Peter Harrington, Manning Shelter Island

**Reference Books:**

1. "Pattern Recognition and Machine Learning" by Christopher Bishop, Springer
2. "Data Mining: A Practical Machine Learning Tools and techniques", Ian Witten, Eibe Frank, Elsevier
3. Machine Learning, Tom Mitchell, TMH

## MCA Semester - V

### Digital Image Processing

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Mathematics - Linear Algebra, Matrix, Vector and Vector Transformation, Differentiation and Integration, Basic Python

#### Course Learning Outcomes

After Successful Completion of the Course, Student Will Be Able to:

- Learn the Fundamental Concepts and Applications of Digital Image Processing
- Understand the Elements of Visual Perception
- Demonstrate Fundamental Image Enhancement Algorithms such as Histogram Equalization and Specification Techniques and Color Image Enhancement
- Describe Various Image Compression and Image Segmentation Methods

#### Syllabus

##### Introduction

Digital Image Processing, Origins of Digital Image Processing, Fields using Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. Understanding Pixel, Overview of Coordinate System, Accessing and Manipulating Pixels

##### Digital Image Fundamentals

Elements of Visual Perception, Light and the Electromagnetic Spectrum, Overview of Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationship between Pixels, Introduction to Mathematical Tools used in Digital Image Processing–Array Operations, Matrix Operations, Linear Operations, Nonlinear Operations, Arithmetic Operations, Set and Logical Operations, Spatial Operations, Vector Operations, Image Transforms and Probabilistic Methods

##### Intensity Transformation and Spatial Filtering

Basics of Intensity Transformation and Spatial Filtering, Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters

##### Filtering in Frequency Domain

History of Fourier Series and Transform, Complex Numbers, Fourier Series, Impulses and their Shifting, Fourier Transform of One Continuous Variable, Sampling, Fourier Transform of Sampled Functions, Basics of Filtering in the Frequency Domain

##### Color Image Processing

Color Fundamentals, Overview of Color Models, Pseudo Color Image Processing, Basics of Full-Color Image Processing, Color Transformation, Smoothing and Sharpening, Image Segmentation based on Color, Noise in Color Images, Color Image Compression



## **Image Compression**

Fundamentals of Image Compression, Image Compression Methods - Huffman Coding, Arithmetic Coding, LZW Coding, Run-Length Coding, Block Transform Coding

## **Image Segmentation**

Fundamentals of Image Segmentation, Point Detection, Line Detection, Edge Models and Basic Edge Detection

## **Text Books:**

1. "Digital Image Processing", Rafael C Gonzalez, Richard E Woods, Pearson Publications
2. "Practical Python and OpenCV: An Introductory, Example Driven Guide to Image Processing and Computer Vision", 3<sup>rd</sup> Edition, Dr. Adrian Rosebrock, PyImage Search Publication

## **Reference Books:**

1. "Digital Image Processing using MATLAB", Rafael C Gonzalez, Richard E Woods, Steven Eddins, Tata McGraw-Hill Publications
2. "Digital Image Processing", William K. Pratt, Wiley Publications
3. "Digital Image Processing and Analysis", B. Chanda, D. Dutta Majumder, PHI Publication
4. "Introduction to Computer based Imaging Systems", Divyendu Sinha, Edward R. Dougherty, PHI Publication
5. "Fundamentals of Digital Image Processing", Anil K. Jain, PHI Publication

## MCA Semester-V

### Remote Sensing and GIS

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

#### Prerequisites

Fundamentals of DBMS

#### Course Learning Outcomes

After successful completion of the course, student will be able to:

- Understand the concepts of Remote Sensing, Platform and Sensors
- Explain Digital Imaging and perform Image Interpretation
- Perform implementation of GIS, Spatial Data Model and Geospatial Analysis

#### Syllabus

##### Concept of Remote Sensing

Introduction, Distance and Remote Sensing, Definition of Remote Sensing, Art and Science of Remote Sensing, Remote Sensing Data, Remote Sensing Process, Source of Energy, Interaction with Atmosphere, Interaction with Target, Recording of Energy by Sensor, Transmission, Reception and Processing, Interpretation and Analysis, Applications of Remote Sensing, Advantages of Remote Sensing, Limitations of Remote Sensing

##### Remote Sensing Platforms and Sensor Characteristics

Introduction, Characteristics of Images, Remote Sensing Platforms, Passive and Active Remote Sensing, Geometry of Remote Sensing, Sensor Resolutions

##### Digital Imaging

Introduction, Digital Image, Sensor, PAN/Multispectral Imaging, Hyper-spectral Imaging, Imaging by Digital Aerial Cameras

##### Visual Image Interpretation

Introduction, Information Extraction by Human and Computer, Remote Sensing Data Products, Metadata of Photographic Products, Image Interpretation, Elements of Visual Image Interpretation

##### Concept of Geographic Information Systems

Introduction, Definition of GIS, Key Components of GIS, Integration of Spatial and Attribute Information in GIS, Three Views of Information System, GIS as a Knowledge Hub, GIS- A Set of Interrelated Subsystems

##### Spatial Data Model

Introduction, Spatial, Thematic and Temporal Dimensions of Geographic Data, Spatial Entity Spatial Data Model: Conceptual and Logical Data Models, Raster Data Model, Vector Data Model, Comparison of Raster and Vector Data Model, Object Oriented Data Model, Complex Data Models, File Formats of Spatial Data

## **Process of GIS**

Introduction, Data Capture, Data Sources, Data Encoding Methods (For Raster and Vector), Linking of Spatial and Attribute Data

## **Geospatial Analysis**

Introduction, Geospatial Data Analysis Methods, Database Query, Geospatial Measurements, Overlay Operations, Network Analysis

## **Google Maps API**

Introduction, Creating First map, Setting the Scene, Creating Maps for Mobile Devices, Controlling Map Container, Making a Simple Marker, Adding InfoWindow, Adding Event to Marker, Changing Marker Icons, Creating Polylines and Polygons, Geocoding, Geocoder Object, ReverseGeocoding

### **Text Books:**

1. "Remote Sensing and GIS", B. Bhatta, Oxford University Press
2. "Beginning Google Maps API 3", Gabriel Svennerberg, Apress

### **Reference Books:**

1. "Textbook of Remote Sensing and Geographical Information Systems", M. Anji Reddy, BS Publications
2. "Google Maps Mashups with Google Mapplets", Michael Young, Apress
3. "Professional Development With Web APIs", Denise M. Gosnell, Wrox

## MCA Semester-V

### Big Data Analytics

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Prerequisites

Core Java, Basic Linux Commands, Concepts of Database Management System, Basic Data Mining Techniques

### Course Learning Outcomes

After successful completion of the course, student will be able to,

- Understand Fundamentals of Big Data and Analytics
- Describe Working of Hadoop Ecosystem
- Develop Big Data Solutions Using Hadoop Components

### Syllabus

#### Introduction to Big Data

Big Data and Its Importance, Big Data Characteristics, Types of Big Data, Differentiate: Traditional and Big Data Approach, Traditional Data Warehouse Approach, Big Data Approach, Advantages of Big Data Analytics, Big Data Applications, Overview of Data Analytics Life Cycle, Big Data and IT/OT Convergence.

#### Non Relational Databases

What is NoSQL?, Differentiate: Relational and Non-Relational, NoSQL Business Drivers, NoSQL Data Architecture Patterns, Using NoSQL to Manage Big Data.

#### Hadoop

Introduction, Overview of Core Hadoop Components: HDFS, Hadoop Common Package, MapReduce, YARN, Overview of Hadoop Ecosystem: Hbase, Hive, HCatalog, Pig, Sqoop, Oozie, Mahout, ZooKeeper, Physical Architecture, Comparing SQL Data Bases and Hadoop, Hadoop Limitations.

#### Map Reduce

Distributed File Systems, Physical Organization of Compute Nodes, Large Scale File-System Organization, Grouping by Key, Coping With Node Failures

Anatomy of Map Reduce Program: Hadoop Data Types, Mapper, Reducer, Partitioner-Redirecting Output from Mapper, Combiner - Local Reduce, Word Counting Example with Predefined Mapper and Reducer Class

Map Reduce Patterns: Count, Min, Max, Average, Top N, Filter, Distinct, Sorting, Joins Algorithms Using Map Reduce: Matrix Multiplication, Relational Operators (Selection, Projection, Union, Intersection), Computing Natural Join, Grouping and Aggregation.

#### Hadoop Distributed File System

Design of HDFS, HDFS Concepts: Blocks, Name Node, Data Node, Block Caching, Command Line Interface, Basic File System Operations, Hadoop File Systems, Interfaces, The Java Interface: Reading data, Writing Data, Directories, Querying The File System, Deleting

Data, Data Flow: Anatomy of File Read, Anatomy of File Write, Coherency Model, Parallel Copying With distcp.

### **Apache Sqoop**

Getting Sqoop, Sqoop Connectors, A Sample Import, Working With Imported Data, Imported Data and Hive, A Sample Export.

### **Apache Pig**

Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

### **Apache Hive**

Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

### **Apache Hbase**

Basic concepts, Clients, Example, Differentiate: Hbase and RDBMS.

### **Link Analysis**

Introduction of Search Engine and Spam, PageRank (Definition, Computation, Modified Page Rank, Using Page Rank in a Search Engine), Efficient Computation of Page Rank (PageRank implementation using MapReduce, Use of Combiners to Consolidate the Result Vector), Topic sensitive Page Rank (Motivation, Implementing, Using Topic Sensitive Page Rank in Search Engine), Link Spam, Hubs and Authorities.

### **Text Books:**

1. "Big Data Science and Analytics - A Hands On Approach", Arshdeep Bahga & Madiseti.
2. "Hadoop: The Definitive Guide", Tom White, 4th Edition, O'Reilly Media.
3. "Hadoop in Action", Chuck Lam, Manning.
4. "Big Data Analytics", Radha Shankarmani, M Vijayalakshmi, 2nd Edition, Wiley.

### **Reference Books:**

1. "Big Data Analytics", Venkat Ankam, Packt Publishing.
2. "Big Data and Analytics", Seema Acharya, Subhashini Chhellappan, Wiley.
3. "Big Data for Dummies", Judith Hurwitz, Alan Nugent, Dr. Fern Halper, and Marcia Kaufman.
4. "Data Science & Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data" EMC Education Services, Wiley.

## MCA Semester-V

### Software Architecture and Design

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15hr)	Practical /Viva	Termwork	Total	L	P	Total
4	-	2	60	40	25	25	150	4	1	5

### Prerequisites

Basic concepts of Database Management Systems, UML and Operating Systems, Experience in Object Oriented Programming

### Course Learning Outcomes

After successful completion of the course, student will be able to,

- Work effectively with a team of software project stakeholders, including customers and members of the development team.
- Use fundamental design principles, methods, patterns and strategies in the creation of a software system.
- Analyze and explain the feasibility and soundness of a software design.
- Identify criteria for the design of a software system and select patterns, create frameworks and partition software to satisfy the inherent trade-offs.

### Syllabus



#### Envisioning Software Architecture

What is Software Architecture and what isn't? Architectural Structures and Patterns, Architectural Design, What makes a Good Architecture? Importance of Software Architecture, The many Contexts of Software Architecture (*Technical, Life-cycle, Business, Professional*), Stakeholders and Architecture Influence .

#### Quality Attributes

Understanding Quality Attributes, Availability, Interoperability, Modifiability, Performance, Security, Testability, Usability, and other Quality Attributes .

#### Architectural Tactics and Pattern Catalog

Architectural Patters, Overview of the Pattern Catalog, Relationship between Tactics and Patterns, Using Tactics Quality Attribute Modeling Analysis: Enabling Quality Attribute Analysis, Quality Attribute Checklist, Other Experiments, Simulation and Prototypes, Analysis at the different stages of lifecycle.

#### Architecture in the Life-cycle

Architecture in Agile Projects: How much Architecture? Architecture methods and Agility, Example of Agile Architecture, Guidelines for the Agile Architecture Architecture and Requirements: Gathering ASRs (Architecturally Significant Requirements) from Requirement Documents, by Interviewing Stakeholders and by Understanding the Business Goals, Capturing ASRs in a Utility Tree.

### **Designing and Documenting Software Architecture**

Design Strategy, Attribute-Driven Design Method (ADD), Steps of ADD Uses and Audiences for Documentation, Notations, Views, Selecting and Combining the Views, Documentation Package, Documentation Behavior, Architecture Documentation and Quality Attributes, Documenting in Agile Projects.

### **Architecture, Implementation, Testing and Reconstruction**

Architecture and Implementation, Architecture and Testing, Reconstruction Process, Raw View Extraction, Database Construction, View Fusion, Architecture Analysis, Guidelines.

### **Introduction to Design Patterns**

What is Pattern? Importance of Design Patterns, Comparison: Architectural Patterns and Design Patterns, Types of Patterns.

### **Text Books:**

1. "Software Architecture in Practice", 3rd Edition, By Len Bass, Paul Clements and Rick Kazman, Addison Wesley Publication

### **Reference Books:**

1. "Essential Software Architecture" by Ian Gorton, Springer Publication