

Semester I										
Subject Code	Subject	Teaching Scheme			Exam Scheme					Credit
		T	L	Tut	S	T	P	TW	Total	
MCA-101	Algorithm Development & Programming Fundamentals	4	2	0	36	60	25	25	150	5
MCA-102	DataBase Management System	4	2	0	36	60	25	25	150	5
MCA-103	Web Designing	4	2	0	36	60	25	25	150	5
MCA-104	Computer Organization and Architecture	4	0	0	36	60	0	25	125	4
MCA-105	Communication Skills	0	2	0	0	0	25	0	25	1
	Elective - I	4	0	0	36	60	0	0	100	4
MCA-111	Financial Management & ERP									
MCA-112	Discrete Mathematics									
MCA-113	Management Information Systems									
MCA-114	Computer Oriented Numerical & Statistical Methods									
	Total								700	24

Semester II										
Subject Code	Subject	Teaching Scheme			Exam Scheme					Credit
		T	L	Tut	S	T	P	TW	Total	
MCA-201	Operating system & Linux Programming	4	2	0	36	60	25	25	150	5
MCA-202	Object Oriented Programming with Java	4	2	0	36	60	25	25	150	5
MCA-203	Data Structures	4	2	0	36	60	25	25	150	5
MCA-204	Software Engineering	4	2	0	36	60	25	25	150	5
MCA-205	Seminar Presentation	0	2	0	0	0	25	0	25	1
	Elective – II	4	0	0	36	60	0	25	125	4
MCA-222	System Analysis Design & Management									
MCA-223	Analysis and Design of Algorithms									
MCA-224	Cyber Security and Digital Forensic									
	Total								750	25

Semester III										
Subject Code	Subject	Teaching Scheme			Exam Scheme					Credit
		T	L	Tut	S	T	P	TW	Total	
MCA-301	Software Design and Testing	4	0	0	36	60	0	25	125	4
MCA-302	Web Development with PHP	4	2	0	36	60	25	25	150	5
MCA-303	Mobile Application Development	4	2	0	36	60	25	25	150	5
MCA-304	Computer Networks and Security	4	0	0	36	60	0	25	125	4
	Elective – III	4	2	0	36	60	25	25	150	5
MCA-331	Python Programming									
MCA-332	Advanced Web Development									
MCA-333	Cloud Computing									
MCA-334	Artificial Intelligence									
	Elective – IV	4	2	0	36	60	25	25	150	5
MCA-341	Applied Machine Learning									
MCA-342	ASP .Net Programming with C#									
MCA-343	Big Data Analytics									
MCA-344	Advanced Java Programming									
	Total								850	28

Semester IV										
Subject Code	Subject	Teaching Scheme			Exam Scheme					Credit
		T	L	Tut	S	T	P	TW	Total	
MCA-401	Project	0	40	0	0	0	400	300	700	20
	Total								700	20
	TOTAL								3000	97

* 40 hrs of on-site work per week (8 hrs * 5 days)

* Subject Codes are Tentative

MCA Semester-I

MCA Semester-I

Algorithm Development and Programming Fundamentals

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

Computer Fundamentals

Course Learning Outcomes

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

- Understand Fundamentals of Programming and Importance of Algorithms Development.
- Develop Basic flowcharts and algorithms for given problem.
- Develop Basic Computer Programs using C Language.

Syllabus

Basics of Algorithm and Problem Solving

Introduction to Program Development Life Cycle, Introduction to Flowchart, Symbols Used in Flowchart, Preparation of Flowchart, Advantages and Limitations of Flowchart, Development of Program Flowchart, Introduction to Pseudo Code.

Introduction to Algorithm, Structured Programming Concepts.

Introduction to Programming in C

Introduction, Standardizations of C Language, Structure of a Simple C Program, Concept of a Variable in C, Data Types in C, Program Statement, Declarations in C, Memory Storage of Data in Computer, C Tokens, Operators and Expressions in C, Type Conversion in C, Working with Complex Numbers, Basic Screen and Keyboard I/O in C, Non-Formatted Input and Output, Formatted Input and Output Functions. Introduction to Compiler - Linker - Preprocessor in C.

Control Statements in C

Specifying Test Condition for Selection and Iteration, Writing Test Expression, Conditional Execution and Selection, Iteration and Repetitive Execution, Which Loop Should be Used?, Goto Statement, Special Control Statements, Nested Loops.

Working with Arrays in C

Introduction to Array, One-Dimensional Array, Declaration of a One-dimensional Array, Initializing Arrays, Accessing Array Elements, Allowed Operations on Arrays, Internal Representation of Arrays in C, Variable Length Arrays, Working with One-dimensional Array, Strings: One-dimensional Character Arrays, Declaration of a String, String Initialization, Printing Strings, String Input, Character Manipulation in the String, String Manipulation, Introduction to Multidimensional Arrays, Declaration of a Two-dimensional Array, Declaration of a Three-dimensional Array, Initialization of a Multidimensional Array, Unsized Array Initializations, Accessing Multidimensional Arrays, Working with Two-dimensional Arrays, Understanding Array of Strings its Initialization and Manipulating.

Functions in C

Introduction to Functions, Concept of Function, Need of Functions in a Program, Function Prototype Declaration, Function Definition, Function Calling, Call by Value Mechanism, Working with Functions, Passing Arrays to Functions, Concept of Global and Local Variables, Scope Rules, Storage Classes in C, Storage Class Specifiers for Variables, Storage Class Specifiers for Functions,

Linkage, Inline Function, Constant Parameters in Functions.
Introduction to Recursion, Basic Needs for Implementing Recursion, Implementing Recursion,
Comparing Recursion and Iteration.

User Defined Data Types in C

Introduction to Structures, Declaring Structures and Structure Variables, Accessing the Members of a Structure, Initialization of Structures, Copying and Comparing Structures, typedef and its Use in Structure Declarations, Arrays of Structures and its Initialization, Structures and Functions, Union, Declaring a Union and its Members, Accessing and Initializing the Members of a Union, Structure Versus Union, Introduction to enum Datatype.

Text Books:

1. "Programming in C", 2nd Edition, Pradip Dey and Manas Gosh, Oxford Publication.

Reference Books:

1. "Introduction to Computer Data Processing and System Analysis", V. K. Kapoor, Sultan Chand and Sons Publication.
2. "C Programming Language", Second Edition, by Brian W. Kernighan and Dennis Ritchie, Prentice Hall Publication
3. "Mastering C", K. R. Venugopal, Tata McGraw Hill Publications.

MCA Semester-I

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

Prerequisites

Computer Fundamentals

Course Learning Outcomes

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

- Understand the Database Concepts and Query Language
- Design the Entity Relationship model
- Explain and Apply Normalization
- Understand Importance of Transaction, Concurrency Control and Recovery
- Implement Procedure, Function and Trigger

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.

Relational Database Design

Pitfalls in Relational Database Design, Functional Dependencies, Normalization.

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, Concurrency Control, Recovery System

Transaction Concept, Transaction State, Need for Concurrent Executions, Serializability concept, Recoverability

Lock Based Protocol and Time Stamp Based Protocol, Deadlock Handling, Insert and Delete Operations

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

Database System Architectures

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

PL/SQL

Introduction to Procedure, Function and Trigger

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

Text Books:

1. "Database System Concepts" 4th Edition, By Abraham Silberschatz, Henry F.Korth and S.Sudarshan, McGraw Hill Publication
2. "Murach's MySQL" 3rd Edition, By Joel Murach, Mike Murach & Associates
3. "Getting Started with NoSQL", By Gaurav Vaish, Packt Publishing

Reference Books:

1. "Database Systems : Design, Implementation and Management", By Carlos Coronel, Steven Morris, Peter Rob, Cengage Learning
2. "Fundamentals of Database Systems" 7th Edition, By Ramez Elmsari, Shamkant B Navathe, Pearson Education
3. "Database Systems : Concepts, Design and Applications", By S K Singh, Pearson Education
4. www.mysqltutorial.org

MCA Semester-I

Web Designing

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

Computer Fundamentals

Course Learning Outcomes

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

- Describe role and significance of various web designing technologies: HTML5, CSS, JavaScript
- Design and Develop Web Sites using HTML Technology.
- Design Web Pages Using CSS.
- Design Web Pages Using Java Script.

Syllabus

Introduction to HTML, Web and Internet

Introduction to Internet - WWW, Understanding the URLs, Introduction to HTML, History of HTML, Understanding Basic Structure of HTML Document, Basic Structure Elements of HTML Document, Introduction to Web Technologies.

Basic HTML Tags

Working with <Head> Section and its Elements - Title, Meta, Link, Base, Style, Script, Isindex.

Working with <Body> Section and its Elements - Block-Level Elements, Basic Text-Level Elements, Font-Style Elements, Phrase Elements, Marking Elements, Linking Element [<a/>], Image Element [], Basic Table Element.

Introduction to HTML5

Introduction to HTML5, Understanding Basic Structure of HTML5 Document, Strict and Loose Type HTML5 Document, Validating HTML Document, Understanding DOCTYPE Element, Root Elements, Metadata Elements, Section Elements, Heading Elements, Introduction to Flow Elements, Introduction to Phrasing Elements, Introduction to Embedded Elements, Introduction to Interactive Elements.

Working with Text, Links and Tables in HTML5

Text Formatting with Physical Style Elements, Text Formatting with Logical Style Elements, Character Entities in HTML5, PRE Element, DIV Element, SPAN Element, Tables Element, Lists, Hyperlinks.

Working with Forms, Images and Media in HTML5

Inserting Image in a Web Page, Image Map, Introduction to Canvas, Exploring FORM Element, Observing Various INPUT Elements, Button Element, Progress Element, Meter Element, Output Element, Datalist Element, Textarea Element, Label Element, Select Element, Option Element, Optgroup Element, Submitting a Form, Details and Summary Element, Menu Element, Command Element, Time Element, KBD Element, Video Element, Audio Element, Embed Element, Object Element, Figure and Figcaption Element.

Cascaded Style Sheet (CSS)

Evolution of CSS, Syntax of CSS, Exploring CSS Selectors, Inserting CSS in an HTML Document, Exploring Background of Webpage using CSS, Exploring Font Properties in CSS, Controlling the

Display of an Element using CSS, Positioning of Element using CSS, Floating and Element using CSS

Exploring Different Model in CSS - Box Model, Line Box Model, Template Layout Model, Multi-Column Model.

Introduction to Java Script

Introduction to Java Scripting and <script>, Client-Side JavaScript, Advantages of JavaScript, Limitations of JavaScript, Placement of Script, JavaScript Datatypes, JavaScript Variables, JavaScript Variable Scope, JavaScript Variable Names, JavaScript Reserved Words, Operators in JS, Control Statements in JAVASCRIPT, Introduction to Java Script Functions, Introduction to Java Script Events, Introduction to Java Script Built-in Objects, Localization in HTML Document via JS and CSS.

Text Books:

1. "HTML 5 Black Book", 2nd Edition, DT Editorial Service, Dreamtech Press Publication.

Reference Books:

1. "HTML 4.0", by Will Train, BPB Publication.
2. "HTML5 in Action", by Rob Crowther, Joe Lennon, Ash Blue and Greg Wanish, Manning Publication
3. "HTML5 Up and Running - Dive into the Future of Web Development", fifth edition, by Mark Pilgrim, O'Reilly Media Publication

MCA Semester-I

Computer Organization and 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	-	0	60	40	0	25	125	4	0	4

Prerequisites

Basic Concept of Mathematics

Course Learning Outcomes

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

- Understand the Elements of Computer Organization and Architecture
- Use Different Number Systems and Codes.
- Describe Digital Representation of Data in a Computer System
- Describe Combinational and Sequential Logic Circuit Design.

Syllabus

Representation of Information

Generation of Computers, Analog and Digital Computer, Block Diagram of Computer, Positive and Negative Numbers, Integers and Reals, 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, Redundant Coding for Error Detection and Correction (Parity and Hamming Code).

Basic Logic Design

Basic Gates & its Truth Tables, Boolean Algebra: Fundamental Concepts, Basic Theorem and Properties, Boolean Functions

Canonical and Standard Forms, Sum of Product, Product of Sum, K-map Method, Don't Care Condition, Combination Circuit Design with Gates, 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, Bidirectional Shift Register with Parallel Load

Counters: Synchronous and Ripple Counter, Simple Arithmetic and logic Circuits.

Memory Devices

Memory Hierarchy, Random Access Memory, Read Only Memory, Serial Access Memory, Direct Access Memory, Cache Memory and Overview of Virtual Memory and Auxiliary Memory.

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" 2nd Edition, By M. Morris Mano, PHI
2. "Microprocessor Architecture, Programming and Applications with 8085" 4th Edition, By Ramesh S. Gaonkar, Penram International Publishing PVT. LTD.

Reference Books:

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

MCA Semester-I

Communication Skills

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

Prerequisites

High school English grammar

Course Learning Outcomes

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

- Effectively Use Tenses and Conditional Sentences
- Understand Importance of Business Communication and its Types
- Practice Basic Business Writing and Correspondence
- Understand Principles of Interviews and Group Discussion

Syllabus

Language Elements

Concord, Tenses, Impersonal Passive Voice, Conditional Sentences, Conjunctions and Prepositions, Idioms.

Understanding Business Communication

Nature and Scope, Communication Networks, Supervisor and Employee Communication, Organizational Structure, Lack of Trust, Unethical Communication.

Non-verbal Communication: Significance and Forms, Elements of Non-verbal Communication.

Cross-cultural Communication: Concept, Different Communication Styles and Strategies.

Technology-enabled Business Communication: Tools, Impact, Effectiveness.

Case Study.

Business Writing and Correspondence

Business Messages: Importance, Types, Approaches, Stages.

Business Letter Writing: Principles and Components, Kinds of Business Letters

Instructions: Written Instructions, Format, Audience Analysis, Characteristics

Business Reports: Kinds, Characteristics, Parts, Elements, Steps

Proposals: Types, Components, Format, Proposal Layout and Design

Resume: Format, Types, Video Resumes, Send Resumes, Online Recruitment: Process and Techniques.

Interviews and Group Discussions

Interviews: Principles, General Preparations, Follow up, Questions

Group Discussion: Planning and Preparation, Steps.

Text Books:

1. "Business Communication", by Meenakshi Raman and Prakash Singh, Oxford University Press
2. "Technical Communication", by Meenakshi Raman and Sangeeta Sharma, Oxford University Press

Reference Books:

1. "Communication Skills for Engineers and Scientists", by Sangeeta Sharma & Vinod Mishra, PHI
2. "Technical Communication", by William Sanborn Pfeiffer and T. V. S. Padmaja, Pearson

MCA Semester I

Financial Management & 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	-	4

Prerequisites

Computer fundamentals, Basic mathematics

Course Learning Outcomes

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

- Prepare Final Account.
- Understand The Steps and Activities in the ERP Life Cycle.
- Identify and Describe Typical Functionality in an ERP System.

Syllabus

Nature of Accounting & Analysis of Business Transactions

Definition, Objective & Scope, Concepts, Principals 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 and ERP models

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?

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.

Text Books:

1. "Financial Accounting & Management", by Rana T. J., B.S. Shah Pub.
2. "Financial Accounting", by P. C. Tulsinyan
3. "Advanced Accounts", by Shukla M.C. & Grawal T.S., Chand Pub.
4. "Advanced Accounts", by R. L. Gupta Sultan Chand Publication
5. "Enterprise Resource Planning" by Alexis Leon, Tata McGraw Hill

Reference Books:

1. "Enterprise Systems for Management", by Luvai F. Motiwalla, Jeff Thompson, PHI
2. "ERP Demystified", by Alexis Leon, 2nd edition McGraw-Hill Education (India) Ltd., 2007

MCA Semester-I

Discrete Mathematics

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

Prerequisites

Algebra, Basic Mathematics

Course Learning Outcomes

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

- Identify the Truth Value of Proposition
- Use Counting Techniques in Calculation
- Use Knowledge about Discrete Mathematics in Problem solving
- Use Graph Theory to solve Real-World Problems

Syllabus

Sets and Propositions

Definition of Sets, Venn Diagrams, Types of set, Finite, Infinite, Power, Countable and Uncountable Sets, Operations on Sets, Mathematical Induction, Principles of Inclusion and Exclusion, Propositions, Tautology and Contradiction.

Permutations, Combinations and Probability

Rules of Sums and Products, Permutations, Permutation with Repetition of Objects, Restricted Permutation, Circular Permutation, Combinations, Restricted Combinations, Combinations with Repetition, Difference between Permutation and Combination.

Probability: Important Definition, Theorems, Conditional Probability.

Relations and Functions

Relation: Definition, Domain and Range of Relation, Kinds of Relation, Types of Relation, Composition of Relations, Partial Ordering and Equivalent Relation

Functions: Definition and Types of Functions, Composition of functions, Inverse of a Function and Pigeon-hole Principle.

Graphs and Trees

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

Trees, Rooted Trees, Path Length, Prefix Codes: Generation, Application, Spanning Trees, Transport Networks Using Ford-Fulkerson.

Group

Groups and Sub-Groups, 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, Rings.

Text Books:

1. "Discrete Mathematics", S. K. Chakraborty and B. K. Sarkar, Oxford University Press
2. "Discrete Mathematics and its Applications", Rosen K. H., 7th Ed., Tata McGraw-Hill Pub. Co. Ltd.

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

Management Information 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	-	-	60	40	-	-	100	4	-	4

Prerequisites

None

Course Learning Outcomes

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

- Understand the Role and Applications of Information Systems in Business Management
- Explain Relationships Between Information Systems, Organization, Management and Strategy
- Illustrate Process of Development and Implementation of MIS for Organizations

Syllabus

Information Systems, Organizations and MIS

Organizations and Information Systems, Impact of Information Systems on Organizations and Business Firms, Using Information Systems to Achieve Competitive Advantage

Management Information System in a Digital Firm: Concept, Definition, Role of MIS, Impact of MIS, MIS and User, MIS as a Control System, MIS A Support to the Management, Management Effectiveness and MIS, Organization as System.

IT Infrastructure and Development Process of MIS

Introduction, Infrastructure Components, Contemporary Hardware Platform Trends, Management Issues, Dealing with Platform and Infrastructure Change, Management and Governance, Making Wise Infrastructure Investments

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

Applications of MIS to E-Business

Applications in Manufacturing Sector: Personnel Management, Financial Management, Production Management, Raw Materials Management, Marketing Management, Corporate Overview

Applications in Service Sector: Introduction, Creating a Distinctive Service, Service Concept, Service Process Cycle and Analysis, Customer Service Design, Service Management System, MIS

Applications in Service Industry.

Decision Support Systems and Knowledge Management

Concept of Decision Support Systems (DSS), DSS Models, Group Decision Support Systems, AI System, Knowledge based Expert System, DSS Application in E-enterprise, MIS and the Benefits of DSS.

ES, SCM and E-Commerce

Enterprise Systems, Enterprise Software and Business Value, Supply Chain Management Systems and its Applications, Global Supply Chains and Internet, Business Value of Supply Chain Management Systems

E-Commerce: E-Commerce and the Internet, E-Commerce: Business and Technology, The Mobile Digital Platform and Mobile E-Commerce, Building an E-Commerce Web Site.

Ethical and Social Issues in Information Systems

Understanding Ethical and Social Issues Related to Systems, Ethics in an Information Society, The Moral Dimensions Of Information Systems.

Case Study

Case Studies Relevant to the Topics.

Text Books:

1. "Management Information Systems Texts and Cases", 5th Edition, by Waman S. Jawadekar, Tata McGrawHill Education Pvt. Ltd.
2. "Management Information System", 12th Edition, by Kenneth C Laudon and Jane P Laudon, PHI, New Delhi

Reference Books:

1. "Management Information Systems" by S. Sadagopan, PHI, New Delhi
2. "Cases in Management Information Systems" by Sanjay Mahapatra, PHI, New Delhi
3. "Management Information Systems" by Uma G. Gupta, Galgotia Publications

MCA Semester I

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	-	-	60	40	-	-	100	4	-	4

Prerequisites

Basic concepts of Mathematics and Statistics.

Course Learning Outcomes

After Successful Completion of the Course, Student will be able to,

- Solve Mathematical Problems by Various Methods
- Identify the Best Curve Fitting for given Data.
- Testing Hypothesis using Various Statistical Tests.
- Identify Single Value that Describes the Characteristics of Given Data.

Statistical Methods (65%)

Introduction & Measures of Central Tendency

Introduction & Scope of Statistics, Scales of Measurements, Collection of data, Functions and Limitations of Statistics, Frequency Distribution (F.D.), Graphical Presentation of F.D.

Arithmetic Mean, Properties of Arithmetic Mean, Weighted A.M, Geometric Mean, Harmonic Mean, Relation between A.M, G.M, H.M.,

Median, Quartiles, Deciles, Percentiles, and Mode.

Measures of Dispersion

Range (IQR, Q.D, Coefficient of Q.D), Mean Deviation, Standard Deviation, Coefficient of Variation, Combined mean and Standard Deviation, Coefficient of Skewness : Karlpearson's & Bowley's.

Probability and Theoretical Distributions

Introduction Probability, Addition Theorem - Examples, Multiplication Theorem - Examples, Conditional Probability Examples, Bayes theorem Examples, Mathematical Expectation Example, Probability Distribution Function.

Discrete Probability Distribution, Bernoulli/Binomial Distribution and Fitting of Binomial Distribution, Poisson Distribution & Fitting of Poisson Distribution, Continuous Probability Distribution, Normal Distribution & Fitting of Normal Distribution, Multinomial Distribution.

Statistical Inference - Tests of Hypothesis

Random Sampling, Test of Hypothesis (except Testing the Significance of an Observed Correlation Coefficient). Test of Significance of Attributes, Test of Significance of Variables for Large Samples and Small Samples.

t-Test, Chi-Square Test, F (Variance Ratio) Test, ANOVA Technique.

Numerical Methods (35%)

Iterative Methods

Solution of Algebraic and Transcendental Equations: Bisection, False-Position, Newton-Raphson Methods

Numerical Solution of Ordinary Differential Equations: Euler's Methods and Runge-Kutta (2nd and 4th) Methods.

Interpolation & Integration

Polynomial interpolation, difference tables, Newton forward and backward Interpolation formula,

Extrapolation, Divided Differences, Lagranges formula, Newton's Divided Difference Formula, Inverse Interpolation.
Trapezoidal rule, Simpson's 1/3 and 3/8 Rules.

Text Books:

1. "Introductory Methods of Numerical Analysis", by S S Sastry, PHI Learning Pvt. Ltd. 4th Edition
2. "Statistical Methods" , by S. P. Gupta, Sultan Chand & Sons

Reference Books :

1. "Quantitative Analysis for Business Decisions", by Bobby Srinivasan & C.L. Sandblom, Mc Graw Hill, 1st ed
2. "Computer Based Numerical and Statistical Methods" By Manish Goyal, Laxmi Publications (P) Ltd.
3. "Computer Oriented Numerical Methods", 3rd Edition, by V. Rajaraman PHIPublication

MCA Semester-II

MCA Semester-II

Operating System and Linux 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

Knowledge of C Programming

Course Learning Outcomes

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

- 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
- Perform Basic Commands, Shell Script
- Implement System Call

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, wait), Process Scheduling: Types and Algorithms, Introduction to Threads

Principles of Concurrency, Semaphores, Monitors, Reader/Writer Problem

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, Virtual Memory, 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).

Linux Basic Commands and Shell Scripts

Basic commands: who, whoami, man, ps, pwd, echo

Directory Handling Command: cd, mkdir, rmdir

File Handling Command: cat, cp, mv, rm, wc

Shell Script: read Command, Command Line Arguments, if, case, expr (arithmetic operation), while Loop, for Loop.

Text Books:

1. "Operating Systems: Internals and Design Principles" 6th Edition, by William Stalling, Prentice

Hall India

2. "UNIX- Concepts and applications" 4th Edition, by Sumitabha Das, TMH Publication

Reference Books:

1. "Operating System Principles" 9th Edition, by Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Wiley-Indian
2. "Modern Operating Systems" 4th Edition, by A. S. Tanenbaum, PHI
3. "Unix Shell Programming", by Yashvant P. Kanetkar

MCA Semester-II

Object Oriented Programming with 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

Fundamental of Programming

Course Learning Outcomes

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

- Develop Object Oriented Software using Java Programming Language
- Develop Multithreaded Applications
- Demonstrate Data Persistence with Files and Databases
- Apply Exception Handling Mechanism for Robust Software Development
- Develop Network based Programs

Syllabus

Object Oriented Programming concepts

Object Oriented Paradigm, Concepts of Object Oriented Programming (OOP): Object and Class, Encapsulation, Data Abstraction, Inheritance, Polymorphism, Dynamic Binding, Message Communication, Benefits of OOP, Applications of OOP .

Java Programming Environment and Structure

History of Java, Salient features of Java, How Java Differs from C, Java and Internet, Java and World Wide Web, Java Development Kit, Using JDK's Command-line tools, Application Programming Interface.

A Simple Java Program, Identifying a Class, Using predefined classes, Defining your own Class, Object Construction, Access Specifiers, Data types, Variables and Constants, Operators, Strings & String Buffer, Input & Output, Control Flow, Arrays, Conversions, Static Fields & Methods, Constructors, Packages, Documentation Comments.

Inheritance, Interface and Inner Classes

Classes, Super Classes & Subclasses, Object - The Universal Superclass, Wrapper Classes, Reflection, Enumeration Classes, Inner Classes, the Interface Concept, Properties of Interfaces, Interfaces and Abstract Classes, Static and Private Methods, Default Methods, Interfaces and Callbacks, Object Cloning, The Comparator Interface.

Collection Framework and Lambda Expression

Java Collection Framework: Separating Collection Interfaces and Implementation, Collection Interface, Iterators, Generic Utility Methods, Interfaces in the Collections Framework

Concrete Collections: Arraylist, Linkedlist, Hashset, Tree Sets, Queues

Lambda Expression: Why Lambdas?, Syntax Of Lambda Expression, Functional Interfaces, Method References, Constructor References, Variable Scope, Processing Lambda Expressions.

Exception Handling and Multithreading

Classification of Exceptions, Exception Handling Techniques, User Define Exception, The Finally Clause, Thread Basics, Thread States, Thread Properties, Implementation of 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, Creating Frame, Frame Properties, The Delegation Event Model, Basics of Event Handling, Specifying Listeners Concisely, The AWT Event Hierarchy, Implementation of Click Event.

Streams, Files and Database Programming

Streams, Text Input and Output, Reading Writing Binary Data, Object Streams and Serialization, Zip Archives, String Tokenizer, Working With Files, JDBC Architecture, Basic JDBC Programming Concepts (Making Connection, Creating Statement and Executing Query), Classes of Java.sql.

Introduction to Network Programming

Introduction to Networking, Introduction to Client/Server Programming, Introduction to Socket Programming.

Text Books:

1. "Core Java volume I & II", 11th Edition, by Cays Horstmann, Gary Cornell, Pearson Education
2. "The Complete Reference JAVA 2", 11th Edition, by Herbert Schildt, Tata McGraw Hill
3. "Programming with Java", by E Balagurusamy, Tata McGraw Hill

Reference Books:

1. "Introduction to Java Programming", by Y. Danial Liang, Pearson
2. "Object Oriented Programming with Java", by Rajkumar Buyya, Tata McGraw Hill

MCA Semester-II

Data Structures

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

Course Learning Outcomes

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

- Identify Appropriate Data Structure for Problem Solving
- Implement Fundamental Data Structures
- Demonstrate Applications of Fundamental Data Structures
- Implement Basic Sorting and Searching Techniques

Syllabus

Introduction to Pointers and Dynamic Memory Allocation

Introduction to Pointers, Understanding Memory Addresses, Address Operator (&), Declaring a Pointer, Initializing Pointers, Indirection Operator and Dereferencing, Void Pointer, Null Pointer, Use of Pointers, One-dimensional Arrays and Pointers, Passing an Array to a Function, Differences Between Array Name and Pointer, Pointers and Strings, Pointer Arithmetic, Pointers to Pointers, Array of Pointers, Pointers To an Array, Two-dimensional Arrays and Pointers, Passing Two-dimensional Array to a Function.

Introduction to Dynamic Memory Allocation, Dynamic Allocation of Arrays, Freeing Memory, Reallocating Memory Blocks, Memory Leak and Memory Corruption, Pointer to Constant, Constant Pointers.

Introduction to Data Structure

Data Structures, Classification of Data Structures, Operations of Data Structures, Define Abstract Data Types.

Introduction to Algorithms, Approaches of Designing an Algorithm, Control Structures used in Algorithms, Understanding Basics of Time Complexity, Introduction to Asymptotic Notation, Rate of Growth in Algorithm, Basics of Storage Management.

Stack and Queue

Introduction to Stack, Applications of Stack, Representation of Stack using Array, Implementation of Operations on Stack Using Array, Implementation of Applications of Stack.

Introduction to Queue, Applications of Queue, Representation of Queue using Array, Implementation of Queue Operations, Understanding Circular Queue.

Introduction to Priority Queue and its Operations, Introduction to Dqueue and its Operation.

Linked List

Introduction to Singly Linked List, Representation of Singly Linked List using Array and Pointer, Implementing Operations on Singly Linked List - Insertion as a First Node, Head 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 in List, Sorting the Linked List, Reversing the Linked List, Traversing a Linked List.

Introduction to Doubly Linked List, Representation of Doubly Linked List, Implementing 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 in Doubly Linked List, Sorting the Doubly Linked List, Traversing a Linked List.

Introduction to Circular Linked List, Representation of Circular Linked List, Implementing Operation of Circular Linked List - Inserting and Deleting a Node in Circular Linked List, Traversing a Circular Linked List

Implementing Stack and Queue Operations using Singly Linked List.

Non-Linear Data Structures

Definition of Tree, Representation of Tree, Basic Terminology of Tree, Types of Tree.

Binary Tree, Types of Binary Tree, Conversion of General Tree to a Binary Tree, Understanding and Implementing Binary Tree Traversal, Constructing a Binary Tree from Traversal Results, Storage Representation and Manipulation of Binary Tree, Applications of Tree.

Binary Search Trees, Operations on Binary Search Trees - Searching for a Node in a Binary Search Tree, Inserting a New Node in a Binary Search Tree, Deleting a Node from a Binary Search Tree, Determining the Height of a Binary Search Tree, Determining the Number of Nodes, Finding the Smallest Node in a Binary Search Tree, Finding the Largest Node in a Binary Search Tree, Traversal and Search in Binary Search Tree, Implementation of Basic Operation in Binary Search Tree, Representation of AVL Tree, Understanding Insertion and Deletion in AVL Tree, Determining Height in an AVL Tree.

Definition of Graph, Representation of Graphs, Types of Graph, Graph Traversal, Graph Traversal and Spanning Forest, Minimum Spanning Tree, Finding the Shortest Path.

Sorting and Searching Methods

Linear Search, Binary Search

Sorting Methods, Internal and External Sorting, Bubble Sort, Quick Sort, Merge Sort, Insertion Sort.

Text Books:

1. "Data Structures Using C", Second Edition, Reema Thereja, Oxford University Press.
2. "Expert Data Structures with C", R. B. Patel

Reference Books:

1. "A Practical Approach to Data Structures and Algorithms", by Sanjay Pahuja, New Age International Publishers
2. "Data structures using C and C++", by Y. Langsam, M. J. Augenstein, A. M. Tenenbaum
3. "Pointers in C", by Yashvant Kanetkar, BPB Publications.
4. "Data Structures Through C", by Yashvant Kanetkar, BPB Publications.
5. "An Introduction to Data Structures with Applications", Second Edition, by Jean-Paul Trembley and Paul G. Sorenson, Tata McGraw Hill Publications.

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	-	2	60	40	25	25	150	4	1	5

Prerequisites

None

Course Learning Outcomes

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

- Describe Software Engineering Process and its Importance
- Practice Conventional and Agile Software Engineering Approaches
- Understand Software Quality and Agile Testing

Syllabus

Introduction to Software Engineering

Software and Role Of Software, Types (nature) of Software, Software Engineering-A Layered Technology, Software Process, Software Myths, Software Engineering Practices.

Software Process

Process Models - A Generic Process Model, Process Assessment and Improvement, Overview of Prescriptive Process Models: Waterfall, Incremental, Evolutionary, Concurrent, Overview of Specialized Process Models: Component-Based, Formal Methods, Aspect-Oriented Software Development, Unified Process, Personal and Team Process Models.

Understanding Requirements

Requirements Engineering, Establishing the Ground Work, Eliciting Requirements, Developing Use Cases, Building the Requirement Model, Negotiating Requirements, Validating Requirements.

Requirements Modeling

Requirements Analysis: Domain Analysis, Analysis Rules of Thumb, Requirements Modelling Approaches: Scenario Based, Information Based, Flow Oriented Strategies.

Design Concepts

Abstraction, Architecture, Aspects, Cohesion, Coupling, Data Design, Design Process, Functional Independence, Good Design, Information Hiding.

Architectural Design

Software Architecture, Importance of Architecture, Architectural Descriptions and Decisions, Architectural Mapping Using Data Flow.

User Interface Design

User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Web App Interface Design.

Agile Development

Agility and Cost of Change, Agile Process, Extreme Programming, Introduction to Agile Process Models: Adaptive Software Development, Dynamic Systems Development Method, Scrum, Crystal,

Feature Driven Development, Lean Software Development, Agile Modeling, Agile Unified Process, Advantages and Disadvantages of Agile.

Agile Requirement Modeling

Agile Requirements Abstraction Model, Requirements Management in Agile Environment, Agile Requirements Prioritization, Agile Requirements Modeling and Generation, Collaborative User Story Creation.

Software Testing using Agile

Agile Testing - Principles, Methods & Advantages, Agile Testing Quadrants: the Purpose of Testing, Technology- Facing Tests that Supports the Team, Overview of Agile Testing Methods: Test Driven, Acceptance Test Driven, and Behaviour Driven Development.

Software Reliability and Quality Assurance

Verification and Validation, Software Quality Assurance, Software Quality, Capability Maturity Model (SEI-CMM), International Standard Organization (ISO), Comparison of ISO-9000 Certification, SEI-CMM, Reliability Issues, Reliability Metrics.

Text Books:

1. "Agile Software Development, Principles, Patterns and Practices", by Robert C. Martin, Prentice Hall
2. "Agile Testing - A Practical Guide For Testers And Agile Teams", by Lisa and Janet
3. "Software Engineering A practitioner's Approach", 6th Edition, by Roger Pressman McGraw-Hill International Edition

Reference Books:

1. "Agile Software Development Ecosystems", by Jim Highsmith, Addison Wesley
2. "Fundamentals of Software Engineering", 3rd Edition, by Rajib Mall, PHI
3. "Software Engineering", 5th Edition, by Ian Sommerville, Addison Wesley

MCA Semester-II Seminar Presentation

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

Prerequisites

Basic English Communication and Presentation Skills

Course Learning Outcomes

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

- Retrieve and Study Relevant Literature for a Topic
- Compile Literature Study in form of Seminar Report

Guidelines

The student will

- identify an appropriate topic in the domain of Computer Science & Applications.
- with help of various means available, identify and refer relevant literature for the chosen topic.
- make up a seminar report from the literature study.
- present seminar report.

MCA Semester-II

System Analysis Design and 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	120	4		4

Prerequisites

Computer Fundamentals

Course Learning Outcomes

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

- Explain Components of System Analysis and Design
- Analyse and Design Information System
- Understand Project Management Techniques

Syllabus

Introduction to System Analysis and Design

Overview of Information System, Information Technology, Information System Components, Business Process Modeling - Business Information System, Characteristics of Information System, Types of Business Information System -Organizational Structure, Systems Development Techniques and Tools, Role of System Analyst.

Feasibility Study

Technical, Operational and Financial Feasibility, Request Approval, Project Selection Requirement and Methods, Steering Committee, Information System Group, Scope, Boundary and Objective of the Project Undertaken.

Decision Analysis

Structured English, Decision Tables, Methods of Performing Cost Benefit Analysis, System 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.

Documentation

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.

Introduction to Project Management

Project, Project Management, Relationships among Portfolio , Program ,Project and Organizational Management, Relationship Between Project, Operations and Organizational Strategy, Business Value, Role and Responsibilities Of Project Manager.

Organizational Influences and Project Life Cycle

Organizational Influences on Project Management, Project Stakeholders and Governance, Project Team, Project Life Cycle.

Project Management Processes

Common Project Management Process Interactions, Project Management Process Groups, Initiating, Planning, Executing, Monitoring and Controlling, Closing Process Group, Project Information, Role of the Knowledge Areas.

Software Metrics and Measure

Process Metrics, Project metrics, Halstead's Software Science, Function Point(FP), Cyclomatic Complexity Measures; Software Project Estimation Models- Empirical, Putnam, COCOMO Estimating Size with Story Points, Velocity, Estimating Time: Ideal Days for Estimated Size, Techniques for Estimation: Estimates Shared, Estimation Scale, Derive Estimation, Planning Poker.

Text Books:

1. "Analysis, Design and Implementation of an Information System", by Henry Lucas, McGraw Hill
2. "Analysis and Design of an Information System", by James Senn, McGraw Hill
3. "Management Information Systems, A Managerial Perspective, by Uma Gupta, Galgotia Publications Pvt Ltd
4. "A Guide to the Project Management Body of Knowledge (*PMBOK® Guide*)", 5th Edition

Reference Books:

1. "Information System Concept for Management", by H. Lucas, McGraw Hill
2. "System Analysis and Project Management", by Cleland and King, McGraw Hill

MCA Semester-II

Analysis and Design of Algorithms

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 NP complete.

Text Books:

1. "Introduction to Algorithms", 3rd Edition, by Thomas Cormen, Charles Leiserson, Ronald Rivest, Clifford Stein, 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", 2nd Edition, by Parag Dave, Himanshu Dave, Pearson Education

MCA Semester-II

Cyber Security and Digital Forensic

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr 15m)	Practical /Viva	Termwork	Total	L	P	Total
4	0	0	60	40	0	25	125	4	0	4

Prerequisites

Fundamentals of Computers

Course Learning Outcomes

After Successful Completion of the Course, Students will be able to,

- Understand Cyber Forensics and its Importance in Information Security
- Explain what is Cybercrime and How it is Planned
- Summarize Different Methods of Phishing and Identity Theft
- Understand about Tools and Methods used in Cybercrime

Syllabus

Introduction to Computer Networks

Data Communications, Networks, Internet, Protocols and, Standards, Layered Tasks, The Internet Model, The OSI Model, Addressing, Overview of UDP and TCP, DNS.

Cybercrime and Cyber Offenses

Introduction to Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrimes

Introduction to Cyber Offenses, Phases of cybercrime used by Criminals, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets, Attack Vector, Cybercrime and Cloud Computing.

Cybercrime: Mobile and Wireless Devices

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile Devices-Related Security Issues.

Tools and Methods Used in Cybercrime

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

Phishing and Identity Theft

Phishing: Methods of Phishing, Phishing Techniques, Spear Phishing, Types of Phishing, Scams, Phishing Toolkits and Spy Phishing, Phishing Countermeasures,

Identity Theft (ID Theft): Personally Identifiable Information (PII), Types of Identity Theft, Techniques of ID Theft, Identity, Theft-Countermeasures, Protecting one's Online Identity.

Understanding Computer Forensics

Introduction, Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer

Forensics Investigation, Tools and equipment requirements for forensics, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics.

Forensics of Hand-Held Devices

Introduction to Cell-Phone Working Characteristics, Hand-Held Devices and Digital Forensics, Toolkits for Hand-Held Device Forensics.

Text Books:

1. "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Nina Godbole, SunitBelapure, Wiley

References Books:

1. "Digital Forensics With Open Source Tools", by Cory Altheide, Harlan Carvey, Elsevier Syngress
2. "Digital Forensics", by André Arnes, John Wiley and Sons

MCA Semester-III

MCA Semester-III

Software Design and 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	-	-	60	40	-	25	125	4	-	4

Prerequisites

Basic Understanding of Software Development Life Cycle and Object Oriented Principles

Course Learning Outcomes

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

- Analyze and Design the System using Object Oriented Methodology and Unified Modeling Language
- Design and Develop Test Plan and Test Specification
- Prepare and Execute Test Cases
- Describe Testing of Object-Oriented and Web-Based Systems

Syllabus

Introduction to Modeling and UML

The Importance of Modeling. Object-Oriented Modeling and Principles, An Overview and Conceptual Model of UML.

Structural Modeling

Classes, Relationships and Other Common Mechanisms, Types of Diagrams, Class Diagrams, Interfaces: Types and Roles, Object Diagrams.

Behavioral Modeling

Interactions, Use-cases, Use-Case Diagrams, Interaction Diagrams, Activity Diagrams, State-chart Diagrams.

Architectural Modeling

Patterns and Frameworks, Component Diagrams, Deployment Diagrams, A Detailed Case Study on System Analysis and Design using Unified Approach.

Introduction to Software Testing

Introduction and Evolution of s/w Testing, Definition and Goals of Testing, Effective and Exhaustive Testing, Software Testing Life Cycle (STLC), Testing Terminology and Methodology.

Verification and Validation

Verification , Verification of Requirements, High-level and Low-Level Design, How to Verify Code? Validation, Validation Activities: Unit Testing, Integration Testing, Function Testing, System Testing, Acceptance Testing, Overview of Regression Testing.

Static and Dynamic Testing

Static Testing: Inspection, Structured Walkthroughs, Technical Reviews

Dynamic Testing

Black-Box Testing: Boundary Value Analysis, Equivalence-Class Testing, White-box Testing: Need of White-box Testing, Basis Path Testing, Graph and Loop Testing, Data Flow Testing.

Test Management

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

Specifications.

Automation and Testing Tools

Need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Cost Incurred in Testing Tools, Guidelines for Automated Testing, Overview of some Commercial Testing Tools.

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.

Testing Web-Based Systems

Overview of Web-Based Systems, Web Technology Evolution And Comparison with Traditional Software, Challenges in Testing Web-Based Systems, Web Engineering, Testing Web-Based Systems.

Text Books:

1. "The Unified Modeling Language User Guide" by Grady Booch, James Rumbaugh, and Ivar Jacobson. Low Price Edition, Pearson Education
2. "Software Testing Principles and Practices" by Naresh Chauhan, Oxford Publication

Reference Books:

1. "Teach yourself UML in 24 Hours ", by Joseph Schumuller, 3rd Edition, Sams Publication.
2. "Foundations of Software Testing ISTQB Certification", by Rax Black, Eric Van Veenendaal, Dorothy Graham, Cengage Learning.

MCA Semester-III

Web Development with PHP

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15 hr)	Practical /Viva	Termwork	Total	L	P	Total
4	0	2	60	40	25	25	150	4	1	5

Prerequisites

Fundamentals of Internet Technologies, HTML5, CSS3, JavaScript and DBMS

Course Learning Outcomes

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

- Develop Web Applications using PHP and Mysql
- Configure Web Server and Deploy PHP Based Web Applications
- Demonstrate Object Oriented and MVC Based Applications using PHP
- Create Web Application using Laravel Framework

Syllabus

Introduction to open source and PHP

A Brief Introduction to Apache, Mysql, PHP and Open Source, Configuring Apache, Mysql and PHP, PHP Structure and Syntax, Creating PHP Program, PHP Using HTML.

Building Blocks of PHP Program

PHP Files, Variables, Data Types, Strings, Arrays, Operators

PHP in Web Applications: Getting Information from the User, Working with HTML Forms, Persisting Data with Cookies, Conditionals, Switch...Case, Loops, Function Declaration, Function Arguments, Return Statement, Type Hinting and Return Types, Reading and Writing Files, File System Functions.

OOP with PHP

Classes and Objects, Properties, Methods, Constructors, Magic Methods, Properties and Methods Visibility, Encapsulation, Namespaces, Autoloading Classes, Inheritance, Overriding Methods, Abstract Classes, Interfaces, Polymorphism, Traits, Handling Exceptions, Anonymous Functions.

Database Connectivity with MySQL and MVC

Connecting to the Database using PHP Data Objects, Performing Queries, Prepared Statements

MVC: The MVC Pattern, using Composer, Managing Dependencies, Autoloader with PSR-4, Adding Metadata, Working with Requests, The Request Object, Filtering Parameters from Requests, Mapping Routes to Controllers, The Router, Model, View, Controller, Implementation of MVC Application, Dependency Injection.

Introduction to PHP Frameworks

The Purpose of Frameworks, The Main Parts of a Framework, Other Features of Frameworks, Authentication and Roles, ORM, Complete and Robust Frameworks, Lightweight and Flexible Frameworks

Popular Frameworks: Symfony 2, Zend Framework 2

Laravel Framework: Composer, Laravel Homestead, Virtual Box, and Vagrant, File Structure, Routing, A Static Method, Controller Class, View and Blade, Environment, Database Migration, Eloquent Model Class, Model, View, Controller Workflow, HTML Form Builder, A CRUD Application, Conditional Rules, Custom Validation, Form Validation.

Text Books:

1. "Beginning PHP6, Apache, and MySQL Web Development", by Wrox, Elizabeth Naramore , Jason Gerner , Yann Le Scouarnec , Jeremy Stolz , Michael K. Glass:
2. "Learning PHP 7", by Antonio Lopez, 2016 Packt Publishing
3. "Beginning Laravel ", by Sanjib Sinha, Apress

Reference Book :

1. "Core PHP Programming", by Atkinson Leon, Suraski Zeev, Pearson Publication
2. "Learning PHP, MySQL & JavaScript", by Robin Nixon, O'Reilly Publication 4th Edition.

MCA Semester-III

Mobile Application Development

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15 hr)	Practical /Viva	Termwork	Total	L	P	Total
4	0	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, Introduction to Testing Mobile Applications, Native Vs. Hybrid Mobile Applications.

Introduction to an Android Platform

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 Its 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
Introduction to 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 LifeCycle, 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,
Content Provider's URI Address, Content Provider Transaction, Adding, Deleting and Updating
Content, Storing and Accessing Files from a Content Provider, Introduction to Native Android
Content Providers.

Intent Filters and Broadcast Receiver, Shared Preferences

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

Introduction to Location Based Services, Emulator with Location Based Services, Selecting a Location
Provider, Finding your Current Location
Hardware Support Phone States, Monitoring Changes in Phone State using the Phone Listener, Using
Intent Receiver to Monitor Incoming Calls
SMS and MMS, Sending SMS at for Telephony, Initiating Phone Calls, Replacing Native Dialer,
Accessing Telephony Properties 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, 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", by Reto Meier, Wrox (Willey) publication
2. "Beginning Hybrid Mobile Application Development", by Mahesh Panhale, Apress
3. "PhoneGap Mobile Application Development Cookbook", by Matt Gifford, PACKT

Reference Books:

1. "Android Wireless Application Development Vol-I Android Essential", by 3rd Edition, Lauren
Dercey & Shane Conder, Pearson
2. "Android in action", 3rd Edition, by W. Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz,
Dreamtech Press.

MCA Semester-III

Computer Networks and 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	-	4

Prerequisites

Basic Concepts of Computer Hardware and Software

Course Learning Outcomes

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

- Understand Types of Networks, Topologies and Network Devices
- Explain Layered Network Model, Protocols and Standards
- Summarize Concepts of Threat, Vulnerability, Attack and Countermeasure
- Describe Message Authentication, Cryptography and Common Algorithms

Syllabus

Introduction

Data Communications, Networks and Types of Networks, Protocols and Standards, Layered Tasks, The OSI Model, TCP/IP Protocol Suit.

The Physical Layer

Analog and Digital Data, Analog and Digital Signals, Periodic and Nonperiodic Signals , Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth, Bit Rate, Bit Length , Digital Signal as a Composite Analog Signal, Attenuation, Distortion, Noise
Guided Media: Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable, Unguided Media: Radio Waves, Microwaves, Infrared.

The Data Link Layer

Error Detection and Correction: Types of Errors, Redundancy, Detection Versus Correction, Forward Error Correction Versus Retransmission, Coding
Block Coding: Error Detection, Error Correction, Hamming Distance, Minimum Hamming Distance
Cyclic Codes: Cyclic Redundancy Check, Checksum: One's Complement, Internet Checksum
Framing: Fixed-Size Framing, Variable-Size Framing,
Connecting Devices: Passive Hubs, Repeaters, Active Hubs, Bridges, Two-Layer Switches, Routers, Three-Layer Switches, Gateway.

The Network Layer

IPv4 Addresses: Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation (NAT)
Need for Network Layer, Internet as a Datagram Network, Internet as a Connectionless Network
IPv4: Segment Header Format, Datagram, Fragmentation, Checksum, Options
IPv6: Advantages, Packet Format, Extension Headers
Forwarding Techniques, Forwarding Process, Routing Table.

The Transport Layer

Process-To-Process Delivery: Client/Server Paradigm, Multiplexing and Demultiplexing, Connectionless Versus Connection-Oriented Service, Reliable Versus Unreliable
User Datagram Protocol (UDP): Well-Known Ports for UDP, User Datagram Checksum, UDP Operation, Use of UDP
TCP Services, TCP Features, Segment, Segment Header Format, A TCP Connection, Flow Control,

Error Control, Congestion Control.

The Application Layer

Name Space: Flat Name Space, Hierarchical Name Space

Domain Name Space, Distribution of Name Space: Hierarchy of Name Servers, Zone, Root Server, Primary and Secondary Servers, DNS in the Internet: Generic Domains, Country Domains, Inverse Domain, Resolution: Resolver, Mapping Names to Addresses, Mapping Address to Names, Recursive Resolution, Iterative Resolution, Caching, DNS Messages and Types of Records
Introduction to Telnet, SMTP, FTP, WWW.

Introduction to Computer Security

Computer Security Concepts, Security Attacks, Security Services, Security Mechanisms, 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.

Firewalls

The Need For Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall Location and Configurations.

Text Books:

1. "Data Communication and Networking", By Behrouz Fourozan, 4th Ed., Tata McGraw-Hill Publications
2. "Network Security Essentials By Applications and Standards", by William Stallings, 4th Edition, Pearson

References Books:

1. "Computer Networks", By Andrew S. Tanenbaum, Prentice Hall Publications
2. "Cryptography and Network Security- Principles and Practice", by William Stallings, 7th Edition, Pearson
3. "Cryptography & Network Security", by Behrouz A. Fourouzan (Special Indian Edition), Tata McGraw-Hill
4. "Cryptography and Network Security", by Atul Kahate, Tata McGraw-Hill

MCA Semester-III

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

Fundamentals of Programming, DBMS and OOP Concepts

Course Learning Outcomes

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

- Create Basic Desktop Applications using Python Programming Language
- Develop Scientific Programs using numpy and pandas
- Plot Diversified Charts
- Create Basic Web Applications using Django Framework

Syllabus

Elements of Python Programming

Introduction to Python Programming Environment, Writing and Executing Basic Python Program.

Data types: Built-in Types, str, bytes, Literals, type() function.

Operators: Arithmetic, Assignment, Relational, Logical, Boolean, Bitwise, Membership, Identity.

Input & Output statements, Command line arguments.

Control Statements: if, else, elif, while, for, break, continue, pass, assert, return.

Sequences

List: create, update, delete elements, list methods, indexing and slicing.

Tuple: create, basic operations, functions to process tuple.

Dictionary: create, update, delete elements, dictionary methods.

Functions

Difference between Function and Method, Create and Use Function, Return Multiple Results from Function, Pass by ObjectReference.

Arguments: Positional, Keyword, Default, Variable length.

Local and Global Variables, Global Keyword, Passing group of Elements to Function.

Anonymous Functions: Using Lambdas with: filter(), map() and reduce()

Object Oriented Programming

Create Class and its Objects, Self variable, Constructor, Instance methods, Class methods, Static methods.

Inheritance: Constructors in Inheritance, Overriding Super Class Constructors and Methods, super(), Method Overloading and Overriding.

Abstract class, Interface.

Exception Handling

Types of Errors, Exceptions, Handling Exceptions, Types of Exceptions, Assert and Except Statements.

Database Interfacing

Introduction, Working with MySQLdb module, Establish connection, Create database and table, CRUD operations, Invoke stored procedure.

Multithreading

Introduction: single and multi tasking, Difference between Process and Thread.

Create Thread: Without Using a Class, Using a Thread Class.

Thread Class Methods, Single Tasking Using a Thread, Multitasking Using Multiple Threads.

Thread Synchronization, Communication between Threads.

Python in Scientific Computing

numpy arrays: zeros(), ones(), reshape(), hstack(), vstack(), arange(), linspace(), logspace(),
asarray(), dot(), matmul(), indexing and slicing.

pandas: Work with Series and Dataframe: create, delete rows and columns, index and select data,
handle missing data, iterate over rows and columns

matplotlib: Plotting- bar graph, histogram, pie chart, line graph.

Python Django

Introduction, Setup environment, Create project, Life Cycle, Admin Interface, Create Views,
Models, Page Redirection, Process Form.

Text Books:

1. "Core Python Programming", 2nd Edition, By R Nageswara Rao, dreamtech press

Reference Books:

1. <https://www.djangoproject.com>
2. "Introduction to Computation and Programming Using Python", 6th edition, by John V Guttag, Prentice Hall of India
3. "Learning Django Web Development", Sanjeev Jaiswal and Ratan Kumar, PACKT

MCA Semester- III

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

Knowledge of - HTML, CSS and Java Script.

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 Frontend and Backend Development Tools and Technology
- Design & Create Webpages with Standard User Interface Using Various Client Side Scripting Libraries

Syllabus

JQueryElements & Events

What Is JQuery and How It Works, Adding JQuery Code to HTML Page, JavaScript Vs JQuery, The Document Object Model, \$() Function, CSS Selectors, Custom Selectors, DOM Traversal, Accessing DOM Elements, Page Load Events, Simple Events, Compound Events, Event Object, Remove Event Handler, Simulating User Interaction.

Styles, Animation & DOM Manipulation

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

Loading Data on Demand using AJAX, Data Formats, Passing Data to Server, Deliver Content based on Ajax Requests, Introduction to Error Handling and Events in AJAX.

Introduction to Bootstrap

Introduction to Bootstrap 4, Installing and Setup, Structure of the CSS Files, Structure of Web Page, Typography Elements .

Bootstrap Component

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

Introduction to Angular JS

Introduction, Key Concept of Angular JS: Angular JS Modules, Data Binding, Dependency Injection, Directives, Installation, Structuring and Bootstrapping Angular JS Application, MVC Entities, Routing, Services, Simple Authentication Management.

Introduction to Node.js

Introduction to NPM - Node Package Manager, Node JS and Modules, Connect Module,

Introduction to Express, Express Setup, Request and Response Objects, MVC Pattern, Express Application Configuration, Rendering Views, Configuring Sessions, Making a Simple Web Application with Express.

Text Books:

1. "Learning JQuery", 3rd Edition, Jonathan Chaffer, Karl Swedberg, Packt Publishing.
2. "Introducing Bootstrap 4", Jorg Krause, Apress Publications.
3. "MEAN Web Development", Amos Q. Haviv, Packt Publishing.

Reference Books:

1. "Getting MEAN - with Mongo, Angular, Express and Node", by Simon Holmes Clive Harber, Manning Publication.
2. "Learning Angular JS", by Ken Williamson, Oreilly Publishing.
3. "Professional Node.js: Building Javascript Based Scalable Software", by Pedro Teixeira, Willey Publication.
4. <https://angular.io/tutorial/>

MCA Semester - III

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	0	2	60	40	25	25	150	4	1	5

Prerequisites

Fundamentals of HTML, Web-design, Database Concept, Linux Operating Systems and Internet Technologies

Course Learning Outcomes

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

- Describe Cloud Computing Ecosystem
- Develop and Deploy Cloud Based Applications on Public Clouds
- Work with Virtualization and Containerization
- Describe OpenStack Fundamentals

Syllabus

Introduction, Architecture and Service Models

Defining Cloud Computing, Cloud Types, Characteristics of Cloud Computing, The Role of Open Standards, Benefits of Cloud Computing, Cloud Architecture, Cloud Computing Service Models (IaaS, SaaS, PaaS, IDaaS, CaaS).

Virtualization

Introduction to Virtualization Technologies, Advanced Load Balancing on Google Cloud, Understanding Hypervisors, Virtual Machine Types, Oracle VirtualBox, KVM.

Public Cloud

Using Amazon Web Services, Understanding Amazon Web Services (AWS), AWS Components and Services, Working with Elastic Compute Cloud (EC2),

Working with Amazon Storage Systems: Amazon Simple Storage Systems (S3), Amazon Elastic Block Storage (EBS),

Understanding Amazon Database Services: Different Database Services of AWS, Amazon Relational Database Service (RDS), Steps for Creating RDS and Connect with EC2 Application

Using Microsoft Cloud Services: Microsoft Cloud Services, Windows Azure Platform, Azure Service, Azure Content Delivery Network, Azure Virtual Machine, SQL Azure, Windows Live Services.

Container, Docker and DevOps

Introduction to Docker Container, Advantage of Container over Virtual Machine, Work with Docker Image and Container, Work with Data Docker, Publish Docker Image on Public Repository, Container Orchestration

Docker Swarm: Docker Swarm Architecture, Steps for Creating Docker Swarm

Kubernetes: Introduction to Kubernetes, Kubernetes Architecture

Docker and DevOps: Continuous Integration, Continuous Delivery, Need for CI/CD, Running Jenkins Master within Docker Container, Setup Build Job, Test Job with Jenkins Master.

OpenStack

Introduction to OpenStack and its Components, Keystone - OpenStack Identity Service, Nova- OpenStack Compute, Swift- OpenStack Object Storage.

Cloud Security

Security in Cloud: Securing the cloud, Securing Data, Establishing identity and Presence, Docker and Security.

Text Books:

1. "Cloud Computing Bible", by Barrie Sosinsky, Wiley Publishing Inc.
2. "OpenStack Cloud Computing Cookbook", 3rd Edition, by Kevin Jackson, Cody Bunch, Egle Sigler, Packt Publishing
3. "Docker in Practice", 2nd Edition, by Ian Miell, Aidan Hobson Sayers, Manning

References Books:

1. <https://docs.aws.amazon.com>
2. <https://docs.microsoft.com/en-us/azure/>
3. <https://docs.openstack.org>
4. <https://help.ubuntu.com/community/KVM>
5. "Cloud Computing Concepts Technology and Architecture", by Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, Prentice Hall
6. "Cloud Computing A Practical Approach", Anthony Velte, Tony Velte, Robert Elsenpeter, McGrawHill
7. "Docker Deep Dives" 4th Edition, by Nigel Poulton

MCA Semester- III

Artificial Intelligence

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", 3rd Edition, Elaine Rich and Kevin Knight, McGraw Hill

Reference Books:

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

MCA Semester-III

Applied 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	0	2	60	40	25	25	150	4	1	5

Prerequisite

Basics of Statistical Methods

Course Learning Outcomes

After Successful Completion of the Course, Student will be able to,

- Distinguish between Supervised and Unsupervised Learning Techniques
- Perform Data Preprocessing Operations
- Apply Classification and Regression Techniques
- Apply Clustering and Association Rules Techniques
- Understand Neural Network Fundamentals

Syllabus

Python Libraries for Machine Learning and Data Preprocessing

Python: Introduction to Python, Basic Loop Structure of Python, Use of Pandas, NumPy, Sklearn, Matplotlib, Scipy, Scikit-learn library

Data Preprocessing: Introduction to Outlier, Missing Data, Types of Data, NULL Values, Handle Categorical Data, Display Data Graphically.

Machine Learning Basics

Introduction, Key Terminology, Types of Machine Learning, Key Tasks, Right Algorithm, Steps for Developing a Machine Learning Application, Python for Machine Learning.

Supervised Learning

Classification

Naïve Bayes Method: Introduction to Bayesian Decision Theory, Naive Bayes Classification, Estimating Accuracy

Decision Tree: Introduction, Building and Splitting Decision Tree, Decision Forest Introduction

Logistic Regression: Logistic Regression Introduction, Sigmoid Function, Classification with Logistic Regression, Find Best Regression Coefficient

K-Nearest Neighbor: Introduction, Distance Measurement, Classification with K-Nearest-Neighbor Case Study.

Regression

Linear Regression: Introduction, Finding Best Fitting Line using Least -Square Method, Solving Regression with Gradient Decent

Decision Tree Regression: Building tree with continuous and Discrete Features, Using CART for Regression Case Study.

Unsupervised Learning

Clustering

Introduction to Cluster Analysis, K-Mean Clustering: Steps for K-Mean Clustering, Generates Clusters,

Hierarchical Clustering: Introduction, Distance Measurement between Clusters, Agglomerative

Method for Creating Clusters, Locating Regions of High Density using DBSCAN
Association Rule Mining: Introduction, Terminology, Working of Apriori Algorithm, Working of Eclat Algorithm
Case Study.

Neural Network

Introduction to Perceptron, Single-layer Neural Network, Introduction to Multilayer Neural Network Architecture, Activating Neural Network using Forward Propagation, Introduction to Back Propagation, Train Neural Network via Back Propagation.

Dimensionality Reduction

Introduction to Principal Component Analysis, steps for PCA Algorithm, Features Transformation, PCA using Python.

Text Books:

1. "Python Machine Learning", by Sebastian Raschka, Packt Publication
2. "Introduction to Data Mining with Case Study", by GK Gupta
3. "Machine Learning in Action", by Peter Harrington, Dreamtech Press .

Reference Books:

1. "Machine Learning Algorithmic Perspective" by Stephen Marsland
2. "Understanding Machine Learning from Theory to Algorithm", by Shai Shalev-Sharwtzs, Shai Ben-David, Cambridge University Press
3. "Machine Learning", by Tom M Mitchell, McGraw Hill
4. "Data Mining: A Practical Machine Learning Tools and techniques", by I H Witten, Eibe Frank, Mark A Hall, 3rd Edition, Elsevier

MCA Semester-III

ASP.NET Programming with C#

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1.15 hr)	Practical /Viva	Termwork	Total	L	P	Total
4	0	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 MultiTier ASP.Net Web Applications
- Develop Windows Applications using C# Language and .NET Framework Controls
- Demonstrate use of Ajax Controls, Xml And Xml Schema Definition in .NET Applications

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, The .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-Define Casts
Advanced C#: Memory Management, Feeling 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, Image List, 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 Webform, Writing Code, Debugging, Anatomy of ASP.NET Application, Introduction of Server Controls, Page Class, Configuring ASP.NET Application, Basic Web Control Classes, Web Control Tags, Webcontrol Base Class, The Default Button, List Controls, Web Control Events, Autopostback, Page Life Cycle, Validation Controls, Calendar and Adrotator Control
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, Details View, Form View.

XML and AJAX

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

Introduction to ASP.NET MVC (Model View Controller)

History of MVC, Principles, MVC Pattern Flow, Advantages of MVC, Webforms and MVC in ASP.NET, Programming Model, Main Elements, Relation between ASP.NET, ASP.Net Webforms 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.

RESTful Web API

Introduction, WCF vs. ASP.NET Web API, Scenarios, Security, RESTful Service, Identification of Resources, Manipulation of Resources, Self-Descriptive Messages, Hypermedia, Implementing and Consuming an ASP.NET Web API.

Text Books:

1. "Professional C#", 3rd Edition, Robinson, Nagel, Watson, Glynn, Skinner, Evjen, Wrox -Wiley Publication
2. "Beginning ASP.NET 4.5 In C#", by Matthew Macdonald, APRESS
3. "Beginning ASP.NET MVC 1.0", by Chiaretta & Nayyeri, Wrox -Wiley Publication
4. "Pro ASP.NET Web API Security Securing ASP.NET Web API", by [Badrinarayanan Lakshmiraghavan](#), Apress

Reference Books:

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

MCA Semester - III

Big Data Analytics

TEACHING SCHEME			EXAM SCHEME (Marks)					CREDIT STRUCTURE		
Lecture	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr 15mins)	Practical /Viva	Termwork	Total	L	P	Total
4	0	2	60	40	25	25	150	4	1	5

Prerequisites

Core Java, Basic Linux Commands, Database Management System

Course Learning Outcomes

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

- Understand the Fundamentals of Big Data and Analytics
- Explain 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.

Hadoop

Introduction, 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

The 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

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

Apache Pig

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

Apache Hbase

Hbase : HBasics, Concepts, Clients, Example, Differentiate: Hbase and RDBMS.

Text Books:

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

Reference Books:

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

MCA Semester- III

Advanced Java 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

Core Java, 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

Syllabus

Introduction to J2EE Technology

Introduction to J2EE Platform, Challenges and Requirements for Enterprise Application Development, Introduction to Enterprise Architecture Styles, J2EE Container Architectures, J2EE Server and Containers, J2EE Architecture, Introduction to Web Containers and microservices.

Java Servlets

Introduction to Java Servlet, Servlet Lifecycle, Servlet Implementations, Servlet Configuration, Servlet Exceptions, Requests & Responses, Servlet Session Tracking, Servlet Context & Collaboration, Introduction to Events and Event Handling [Context Level Events and Session Level Events] Introduction to Filter: Filter and Filter Chain, Filter API, Deployment Descriptor for Filter, Sample Filter in Web Application.

Java Server Pages and Java Beans

Introduction, JSP Directives, Scripting Elements, Introduction to Java Beans, Standard JSP Actions, JSP Implicit Objects, Scopes, Expression Language, JSP Tag Extensions: Tag Handlers, Library Descriptors, using with JSP Page, Deploying and Packing, Integrating JSPTL into JSP Pages, Introduction to XML and XML Usage, Developing MVC Application Using Servlets, JSP and POJO Beans.

Web Services - Restful

Define REST, Restful Architecture, Restful Clients, Accessing Restful Services, Restful Web Service Design, Introduction to JAX-RS and Jersey, Annotations, Web Service Architecture, Implementation with JAX-RS - Jersey, Securing Web Service, Performance.

Introduction to Hibernate

Understanding Persistence and Paradigm Mismatch, Introduction to Object-Relational Mapping, Java Hibernate, Hibernate Architecture, Hibernate Object Life Cycle, Hibernate Configuration File and Mapping Files, Working with Hibernate Objects, Session Operations, Hibernate Strategies, Mapping of Relations, Introduction to Fetching Strategies, Querying Using HQL.

Text Books

1. "Professional Java Server Programming J2EE 1.3 Edition", by Subrahmanyam Allamaraju, Cedric Buest, Daniel O'Connor Et Al. Apress Publications.
2. "Restful Java Web Services", by Jose Sandoval, Packt Publication.
3. "Hibernate in Action", by Christian Bauer, Gavin King, Manning.

Reference Books:

1. "Java Server Programming Java EE 7 (J2EE 1.7) Black Book", by Dreamtech Press
2. "Professional Java Server Programming J2EE Edition", by Daniel O'Connor, Gordon Van Huizen, Jason Diamond Et Al. Wrox Publications.
3. "Head First Servlet and JSP", by Bryan Basham, Kathy Sierra, Bert Bates, O'Reilly Publication