SACRED HEART COLLEGE (AUTONOMOUS)

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Ready for
Every Good Work

A Don Bosco Institution of Higher Education, Founded in 1951 * Affiliated to Thiruvalluvar University, Vellore * Autonomous since 1987

Accredited by NAAC (4th Cycle – under RAF) with CGPA of 3.31 / 4 at 'A+' Grade

BACHELOR OF COMPUTER APPLICATIONS

PROGRAMME STRUCTURE FOR COMPUTER APPLICATIONS 2021-2022 ONWARDS

I Year (2021-2022 Batch)

Sem	Subject Code	Part	Subject	L	P	CD	CA	SEM
I	LT114	I	Tamil – I	5		3	50	50
	LE115BT	II	English – I	5		2	50	50
	CE103	II	Communicative English - I			1	50	50
	AM114D	III	Mathematical Foundations – I	6		4	50	50
	CA107	III	Digital Computer Fundamentals	4		4	50	50
	CA108	III	Internet Concepts and Web Design	4		4	50	50
	PCA104	III	Practical - I : Internet Concepts and Web Design		2	2	50	50
	SK104	IV	Communication Skills	2		1	-	100
	VE105B / VE105A	IV	Value Education - I / Christian Religion - I	2		1	-	100
	LE115BP		English Lab - I			1	-	100
				28	2	23		
II	LT214	I	Tamil – II	5		3	50	50
	LE215BT	II	English – II	5		2	50	50
	CE203	II	Communicative English - II			1	50	50
	AM214D	III	Mathematical Foundations – II	6		4	50	50
	CA207	III	Programming with C	4		4	50	50
	CA208	III	Operating System	4		4	50	50
	PCA204	III	Practical-II : Programming with C		2	2	50	50
	SK204	IV	Leadership Skills	2		1	-	100
	VE205B / VE205A	IV	Value Education - II / Christian Religion – II	2		1	-	100
	LE215BP		English Lab – II			1	-	100
				28	2	23		

I BCA

Semester – I   **4 Hours/4 Credits**

DIGITAL COMPUTER FUNDAMENTALS

1. COURSE OBJECTIVES

- To know and understand the fundamentals of a computer system
- To understand the basics of digital design and number systems
- To learn about combinational gates and k-maps to simplify the Boolean functions
- To know and understand the purpose of sequential circuits
- To learn the purpose of different registers and counters

2. COURSE OUTLINE

UNIT 1: INTRODUCTION TO COMPUTERS

Introduction: Characteristics of Computers – Evolution of Computers – Computer Generations. Basic Computer Organization: Input and Output Unit – Storage Unit – ALU – CU – CPU. Processor: Central Processing Unit – Memory: Main memory - Secondary Storage: Magnetic Tape, Magnetic Disks, Optical Disks, Main storage devices.

UNIT 2: BASICS OF DIGITAL DESIGN

Binary Systems: Digital Computers and Digital Systems - Binary Numbers - Number Base Conversions - Octal and Hexadecimal Numbers – Complements - Signed Binary Numbers - Binary Codes - Binary Storage and Registers - Binary Logic - Boolean Algebra and Logic Gates: Basic Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Digital Logic Gates - IC Digital Logic Families.

UNIT 3: K-MAPS AND COMBINATIONAL CIRCUITS

Simplification: K-Map Method – Two, Three Variable Maps - Table Method - Don't Care Conditions - NAND, NOR Implementation. Combinational Logic Circuits: Introduction - Design Procedure – Adders – Subractors - Code Conversion – Analysis Procedure - Binary Parallel Adder – Decoders – Encoders - Multiplexers – Programming Logic Array (PLA).

UNIT 4: SEQUENTIAL CIRCUITS

Sequential Logic: Flip-Flops - Triggering of Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure – Design of Counters.

UNIT 5: DIGITAL COMPONENTS

Registers and Counters: Registers, Shift Registers, Ripple Counters, Synchronous Counters – Timing Sequence – The Memory Unit – Examples of Random Access Memories.

3. TEXTBOOKS

    i)   Pradeep K. Sinha, Priti Sinha, "Computer Fundamentals", Sixth Edition.BPB Publications.
            UNIT 1   **: Ch.1, 2, 7 & 8**
    i)   M. Morris Mano, "Digital Logic and Computer Design", 3rd edition, Pearson Education, Delhi, 14th Impression 2012.
            UNIT 2   **: Ch.1 & 2**
            UNIT 3   **: Ch. 3, 4 & 5**
            UNIT 4   **: Ch. 6**
            UNIT 5   **: Ch. 7**

4. REFERENCES

1) Anita Goel, "Computer Fundamentals", Pearson India, 2010
2) Donald P Leech, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", Tata Mc Graw Hill, 2007.
3) Bartee, "Digital Computer Fundamentals", Tata McGraw Hill Publications.
4) Malvino, "Digital Computer Electronics", Tata McGraw Hill Publications

5. WEB REFERENCES
- https://www.tutorialspoint.com/digital_circuits/index.htm
- https://www.javatpoint.com/digital-electronics
- https://www.electronics-tutorials.ws/logic/logic_1.html

6. SUPPLEMENT LEARNING
- Four, Five, Six K-Maps
- RAID storage devices
- Computer Languages
- Data Representation
- Computer Arithmetic

Semester – I   **4 Hours/4 Credits**
INTERNET CONCEPTS AND WEB DESIGN

1. COURSE OBJECTIVES
- To know the concept of basics of Internet.
- To become knowledgeable in Fundamentals of Html
- To ensure that the students have a basic understanding of creating Forms and Frames.
- To understand the concept of Cascading Style Sheet.
- To be aware of the method of Java Script.

2. COURSE OUTLINE

UNIT 1: INTERNET CONCEPTS
Introduction to Internet: Internet history – Internet Access –Internet Services and Features - TCP/IP – Telnet – Changing the Password – WWW – Web Page – Net Surfing – Web Browser – Internet Addressing – Internet Protocols – Searching the Web: Web Index – Web Search Engines – Meta Search Engines – Directories – Specialized Directories – Electronic Mail – E mail messages – Managing Mails – Signature Feature - Advantages and Disadvantages of E mail.

UNIT 2: BASICS OF HTML
Core Elements and Attributes: <html> Element, <head> Element, <title> Element><body> Element – Basic Text Formatting: Creating Paragraph – Creating Line Breaks – Creating Preformatted Text- Presentational Elements – Phrase Elements – Lists –Links: Linking to other Documents – Linking to E-mail Addresses –Creating Links with the <a> Element – Images: Adding Images to your site – Using images as Links – Tables: Basic table Elements and Attributes - Rowspan – Colspan.

UNIT 3: FORMS AND FRAMES
Forms Introduction: Creating a Form with the <form> Element – Action Attribute – Method attribute – Id Attribute – Name Attribute - Onsubmit Attribute - Onreset Attribute - Form

Controls: Text inputs – Buttons – Check boxes – Radio Buttons – Select Boxes – File Select Boxes. Frames: Introducing the Frameset -   The <Frameset> Element: Cols Attribute - rows Attribute – The <Frame> Element: The src Attribute – The name Attribute – The Frame Border Attribute – The margin width and height attribute - Creating Links between Frames

UNIT 4: CSS
CSS Introduction- CSS Rules: The <link> and <style> Element – CSS Properties: Controlling Fonts –Text Formatting –CSS3: CSS Rounded Corner – Border Images – Multi Background –Color – Gradients –Shadow – Text - 2D and 3d Transform.

UNIT 5: JAVASCRIPT
Jscript: Introduction –Adding a script to your Pages: Comments in a Javascript – The <noscript> Element - The Document Object Model: Objects, Methods and Properties – The Forms Collection - Form Elements - Starting to Program with JavaScript: Variables – Operators – Functions – Conditional Statements – Working with Javascript: Form Validation.

3. TEXTBOOKS
1) Dr. Raymond Nancy Philip, "A TEXTBOOK of Internet and Web Designing", First Edition, 2017
   Unit 1 : Ch 1.1-1.4, 1.8–1.10, 1.13 – 1.17, 2.1- 2.10
2) Jon Duckett, "Beginning Web Programming with HTML, XHTML and CSS", 2nd Edition, 2008.
   Unit 2 : Ch 1,2,3,4
   Unit 3 : Ch 5, 6
   Unit 4 : Ch 7
   Unit 5 : Ch 11, 12

4. REFERENCES
1) Joel Sklar. Principles of Web Design. Singapore: Thomson Asia Pvt. Ltd, 2000 Powell, Thomas A.
2) Web Design – The Complete Reference. Tata McGraw Hill Edition, 2000.

5. WEB REFERENCES
- www.jquery.com
- www.w3schools.com
- www.hscripts.com
- http://www.html5andcss3.org/http://www.tutorialspoint.com/html5/
- http://www.html-5-tutorial.com/
- https://www.tutorialspoint.com/css/css3_tutorial.htm

Online Tutorial
- https://edu.gcfglobal.org/en/internetbasics/what-is-the-internet/1/
- https://www.w3schools.com/html/

Online Quiz
- https://www.geeksforgeeks.org/html-course-practice-quiz-1/
- https://www.w3schools.com/css/css_quiz.asp

Online Compiler
- https://www.tutorialspoint.com/online_html_editor.php
- https://www.w3schools.com/js/js_editor.asp

6. SUPPLEMENT LEARNING
- Network
- Meta Tag
- Div Tag
- Lay outs
- Responsive Web Design (RWD)

Semester – I   **2 Hours/2 Credits**

PRACTICAL - I: INTERNET CONCEPTS AND WEB DESIGN

1) Basic HTML tags
2) Background color and Images
3) HTML Link and List
4) HTML Tables and Frames
5) HTML Form Controls
6) CSS Inclusion and Properties
7) CSS 2D and 3D Transform
8) Jscript – Variables, constants, functions
9) Jscript – Methods and Functions
10) Jscript Validation

Semester – II   **4 Hours/4 Credits**

PROGRAMMING WITH C

1. COURSE OBJECTIVES
- To enhance their analyzing and problem-solving skills and use the same for writing programs in C.
- To develop logics and that will help them to create programs, applications in C.
- To identify programming task involved in a given computational problem.
- To identify tasks in which the numerical techniques learned are applicable and apply them to write programs.

2. COURSE OUTLINE

UNIT – I: INTRODUCTION OF C PROGRAMMING
Steps Involved in Computer Programming – Problem Definition – Outlining The Solution – Flow Chart – Developing Algorithms - Structure of a C program – Basic data types– constants and variables – operators and expressions – Control Constructs (if, switch, while, do…while, for, break and continue, exit function, goto and label).

UNIT – II: ARRAYS AND FUNCTIONS
Arrays (declaration, one and two dimensional arrays) - Character Arrays and Strings. Function Fundamentals (General form, Function Definition, Function arguments, return value) – Parameter passing: call-by-value and call-by-reference – Recursion – Passing Arrays to Function – Passing Strings to Function.

UNIT – III: POINTERS
Understanding Pointers – Accessing the Address of a Variable – Declaring the Pointer Variables – Initialization of Pointer Variables – Accessing a Variable through its Pointer – Pointer Expressions – Pointers and Arrays – Pointers and Character Strings – Array of Pointers – Pointers as Function Arguments – Functions returning Pointers – Pointers to Functions.

UNIT – IV: STORAGE CLASSES, STRUCTURES AND UNIONS
Scope rules (Local variables and global variables, scope rules of functions) -Type modifiers and storage class specifier. Structures – Basics of Structure – Declaring of Structure – Referencing Structure elements - Array of Structures – Nesting of Structures - Passing Structures to function – Pointers and Structures - Unions.

UNIT – V: FILE MANAGEMENT IN C
Introduction – Defining and Opening a File – Closing a File – Input / Output Operations on Files – Command Line Arguments.

3. TEXTBOOK
1) E. Balagurusamy, "Programming in ANSI C", Seventh Edition, McGraw Hill Education Private Limited, New Delhi: 2017.
   - **Unit – I: Ch. 1 – 6**
   - **Unit – II: Ch. 7 – 9**
   - **Unit – III: Ch. 11**
   - **Unit – IV: Ch. 10**
   - **Unit – V: Ch. 12**

4. REFERENCES
1) Yashavant Kanetkar, "Let us C", BPB Publications, Tenth Edition - New Delhi: 2010
2) Ashok N. Kamthane, "Programming in C", Second Impression, Pearson: 2012.

5. WEB REFERENCES
- http://www.c4learn.com/?gclid=COK1y6nHk7wCFcUA4godmlgAKA/
- http://www.cprogramming.com/tutorial/c-tutorial.html/
- http://www.tutorialspoint.com/cprogramming/

6. SUPPLEMENT LEARNING
- Command Line Arguments
- Recursive Algorithm

Semester – II   **4 Hours/4 Credits**
OPERATING SYSTEM

1. COURSE OBJECTIVES
- To study the basic concepts of operating systems and the design of operating system
- To understand various CPU scheduling algorithms, Process synchronization and the deadlocks.
- To learn the memory management, paging and segmentation techniques.
- To be aware of the concepts of file system, allocation methods and Free space management.
- To understand the concepts of disk scheduling.

2. COURSE OUTLINE

UNIT I: INTRODUCTION
Operating System Definition - Computer Organization, – Computer System Architecture – Operating System Structure – Operating System Operations – Computing Environments – Open Source Operating Systems – Operating System Services – User and Operating System –

System Calls – Types of System Calls – System Programs – Operating System Design and Implementation – Operating System Structure.

UNIT II PROCESS MANAGEMENT
Process Concept - Process Scheduling - Operations on Processes – Inter Process Communication – CPU Scheduling basic Concepts - Scheduling Criteria – Scheduling Algorithms – Multiple Processor Scheduling.

UNIT III PROCESS SYNCHRONIZATION & DEADLOCK
Background - The Critical-Section Problem - Synchronization Hardware - Semaphores – The Readers Writers Problem – Dinning Philosophers Problem - Critical Regions – Deadlock Concepts and Characterization - Methods for Handling Deadlocks – Deadlock Prevention and Avoidance – Detection and Recovery from Deadlock.

UNIT IV MEMORY MANAGEMENT
Background - Swapping - Contiguous Memory Allocation – Paging – Structure of the Page Table - Segmentation - Segmentation with Paging - Virtual Memory: Background - Demand Paging, Page Replacement.

UNIT V FILE SYSTEM
File Concept - Access Methods - Directory and Sisk Structure – File System Mounting - File Sharing -Protection - File-System Structure - File-System Implementation – Directory Implementation - Allocation Methods - Free-Space Management - Mass Storage: Overview of mass storage - Disk Structure - Disk Attachment - Disk Scheduling.

3. TEXTBOOK
1) Silberschatz and Galvin, "Operating System Concepts", 9th Edition, John Wiley & Sons Inc., 2016

        UNIT I   **: Chapter 1,2**
        UNIT II   **: Chapters 3, 5**
        UNIT – III   **: Chapters 6**
        UNIT IV   **: Chapters 7, 8**
        UNIT V   **: Chapter 9,10,11**

4. REFERENCES
1) Deitel Harvay M., "Operating Systems", 2003, Pearson Education Publications, Singapore.
2) Godbole Achyut S., "Operating Systems", 2002, Tata McGraw Hill Publishing Company Limited, New Delhi.
3) Milan Milankovic, "Operating System-Concepts and Design", 2005, Tata McGraw Hill Publishing Company Limited, New Delhi.
4) Tanenbaum Andrew S. & Woodhull Albert S., "Operating Systems – Design and Implementation", 2002, Pearson Education Publications, Singapore.
5) William Stallings, "Operating Systems – Internals and Design Principles", 2006, Pearson Education Publications, Singapore.

5. WEB REFERENCES
- http://www.cs.nthu.edu.tw/~ychung/slides/CSC3150/Abraham-Silberschatz-Operating-System-Concepts---9th2012.12.pdf
- https://repository.dinus.ac.id/docs/ajar/Operating_System.pdf

6. SUPPLEMENT LEARNING

- Distributed Operating System
- Distributed Storage Systems
- Mobile Operating Systems
- Operating System Security

Semester – II   **2 Hours/2 Credits**

PROGRAMMING WITH C

1) Data types

2) Operators and Expressions

3) Decision making statement

4) Looping statement

5) Arrays

6) Functions

7) Structures

8) Unions

9) Pointer

10) Files

BACHELOR OF COMPUTER APPLICATIONS

PROGRAMME STRUCTURE FOR COMPUTER APPLICATIONS 2021-2022 ONWARDS

II Year (2021-2022 Batch)

Sem	Subject Code	Part	Subject	L	P	CD	CA	SEM
III	CA312	III	Computer Networks	4		4	50	50
	CA313	III	Programming with JAVA	4		3	50	50
	CA314	III	Data Structures using C	4		4	50	50
	AC309	III	Allied – Financial Accounting - I	6		4	50	50
	CA315 A/B/C	III	Discipline Specific Elective I	4		3	50	50
	PCA306	III	Practical -III - Data Structures using C		2	2	50	50
	PCA307	III	Practical-IV : Programming with JAVA		2	2	50	50
	SK304	IV	Technical Skills	2		1	-	100
	VE306	IV	Human Rights	2		1	-	100
		VI	Certificate Course - I #			2#		
				26	4	**24+2#**		
IV	CA412	III	Software Engineering	4		4	50	50
	CA413	III	Enterprise Applications using .NET	4		3	50	50
	CA414	III	Relational Database Management System	4		4	50	50
	AC411	III	Allied – Financial Accounting - II	6		4	50	50
	CA415	III	Emerging Computing Paradigms	4		3	50	50
	PCA406	III	Practical – V : Enterprise Applications using .NET		2	2	50	50
	PCA407	III	Practical–VI : Relational Database Management System		2	2	50	50
	SK404	IV	Employability Skills	2		1	-	100
	VE406	IV	Environmental Science	2		1	-	100
	CO-DED	V	Outreach Programme			2		
	C0-SHE	V	Groups and Movements			2		
		VI	Certificate Course – II#			2#		
				26	4	**28 + 2#**		

COMPUTER NETWORKS

1. COURSE OBJECTIVES
- To understand the organization of computer networks.
- To test and implement the different network connections.
- To understand the performance of network layers like IPv4 and IPv6 addresses.
- To understand the way protocols currently in use in the Internetwork and the requirements for designing network protocols.
- To understand the concepts of WWW and electronic mail.

2. COURSE OUTLINE

UNIT–I: INTRODUCTION TO COMPUTER NETWORKS
History of Computer Networking and the Internet – Data Communications –Networks– Network Types–The OSI Model–Multiplexing– Transmission Media–Guided Media and Unguided Media.

UNIT–II: DATALINK LAYER
Introduction to Data Link Layer – Error Detection and Correction – Block Coding –Cyclic Codes: Cyclic Redundancy Check. Data Link Control: DLC Services – HDLC– PPP: Services, Framing and Transition Phase.

UNIT– III: NETWORK LAYER
Network Layer Services – Network Layer Performance – IPV4 Addresses: Address Space, Classful Addressing, Classless Addressing and DHCP. IPV6addressing–Packet Format – Mobile IP.

UNIT–IV: TRANSPOR TLAYER
Introduction to Transport Layer – Transport Layer Protocols: Simple Protocol – Stop-and-Wait Protocol – Go-Back-N Protocol and Selective Repeat Protocol. UDP, TCP: Services, Features and Connection – SCTP.

UNIT–V: APPLICATION LAYER
Introduction–ClientServerProgramming–WWWandHTTP–FTP–ElectronicMail –Telnet–DNS – SNMP: Managers and Agents – Management Components.

3. TEXTBOOK

1) Behrouz A Forouzan, "Data Communication and Networking", 5th Edition, McGraw Hill Education, 2013.

Unit– I	:	Ch. 1.1 – 1.5, 2.3, 6.1, 7.1 – 7.3
Unit– II	:	Ch.9.1 – 9.2, 10.1 – 10.4, 11.1 – 11.4
Unit– III	:	Ch. 18.1, 18.3 – 18.4, 19.1, 22.1 – 22.2,19.3
Unit– IV	:	Ch. 23.1 – 23.2, 24.1 – 24.4

4. REFERENCES

1) James F.Kurose and Keith W.Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 6th Edition, Pearson Education, 2017.
2) Larry L.Peterson and Bruce S.Davie, "Computer Networks: A System Approach", Elsevier, 4th Edition, 2007.
3) Andrew S.Tanenbaum, "ComputerNetworks",4th Edition, Prentice-Hall of India, 2003

5. WEB REFERENCES

- https://www.rfc-editor.org/
- https://www.hpe.com/us/en/networking.html.html
- https://www.tutorialspoint.com/data_communication_computer_network/index.htm
- https://www.w3schools.in/types-of-network-protocols-and-their-uses/

6. SUPPLEMENT LEARNING

- Periodic Analog Signals
- SONET
- IEEE 802.11 Project
- Connecting Devices and Virtual LANS
- Cryptography and Network Security

Semester – III   **4 Hours/3 Credits**

PROGRAMMING WITH JAVA

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1. COURSE OBJECTIVES

- To understand the basics of Object Oriented Programming concepts, Character Set, tokens, variables, data types, operators and control structure.
- To understand the fundamental concept of Java like class and object, array, methods, constructors and inheritance.
- To understand the concept of package, Exception Handling and Threading.
- To understand the concepts of Applets, AWT and SWING.

2. COURSE OUTLINE

UNIT - I: BASIC CONCEPTS

Foundations of Java – Java Essentials: Elements – Java API – Variables and Literals – Data types – String Classes – Operators – Constants - Comments – Control Statements – Arrays – String Handling

UNIT - II: CLASSES AND OBJECTS

Classes and objects – General form, creation, constructors, constructor overloading, copy constructor, "this" keyword, Static members, finalize method, Inner class and anonymous classes, Inheritance – inheriting, abstract classes and final classes, Interfaces – structure, implementation, interface inheritance.

UNIT - III: PACKAGES, EXCEPTION HANDLING AND THREADING

Packages – Package Hierarchy, Import Statement, Hiding the Classes, Access Control Modifiers, Exception Handling – Default Exception – User Defined Exception Handling, Exception and Error Classes, Throw and Throws. Threading – Life Cycle, Creating and Running, Methods in Thread Class, Priority Thread, Synchronization, Dead Lock, Inter Thread Communication.

UNIT - IV: APPLETS AND AWT

Applets – Life Cycle - Applet Class – Developing Applet Program – Passing values through parameters – Graphics in Applet – Event Handling – GUI - AWT Components: Frames, panels, dialog boxes, FileDialog – Layout Managers, labels, textfileds, buttons, checkbox, radio buttons, choice lists, lists, scrollbars, menu bars and menu items.

UNIT - V: SWING

SWING – Component Classes – JFrame – JPanel – JpasswordField – Jtable – JoptionPane – JtabbedPane – Jtree – JProgressBar – JfileChooser – JcolorChooser – Jslider - Developing SWING Application.

3. TEXTBOOK
1) Sagayaraj, Denis, Karthik and Gajalakshmi, "Java Programming for Core and advanced Learners", Universities Press, 2018
   Unit – I : Ch. 1, 2, 3, 5, 6
   Unit - II : Ch. 4, 7, 8, 9, 10, 11
   Unit - III : Ch. 16
   Unit – IV : Ch. 12, 13
   Unit – V : Ch. 13, 14

4. REFERENCES
1) C. Muthu, "Programming with Java", Tata McGraw Hill, 2006.
2) Herbert Schildt, "The Complete Reference – Java 2", 4th Edition, Tata McGraw Hill, 2001.
3) Balaguruswamy, "Programming with JAVA", Tata McGraw Hill, 1999.

5. WEB REFERENCES
Online Tutorial
- http://www.tutorialspoint.com/java/
- http://javabeginnerstutorial.com/core-java/

Online Quiz
- https://www.tutorialspoint.com/java/java_online_quiz.htm
- http://withoutbook.com/OnlineTestStart.php?quizId=2

Online Compiler
- https://www.codechef.com/ide
- https://www.tutorialspoint.com/compile_java_online.php

6. SUPPLEMENT LEARNING
- Keyboard Inputs
- Multidimensional Arrays
- Exception Catch Block search pattern
- JDBC Connections
- Files creation and Random Access Files

DATA STRUCTURES USING C

1. COURSE OBJECTIVES
- To understand the performance of the implementations of basic linear data structures.
- To understand the various operations of stack and queue.
- To implement the linked data structures such as linked list and binary trees.
- To be familiar with several sorting and searching algorithms.
- To be familiar with some graph algorithms such as shortest path and minimum spanning tree.

2. COURSE OUTLINE

UNIT - I: ARRAYS AND LINKED LIST
Arrays: Operations with Array – One dimensional array – Two dimensional arrays – Special Matrices. Linked List: Implementation of List – Linear List Concepts – Insertion, Deletion, Retrieval and traversal – Linked List Concepts – Linked List Algorithms – Circular Linked List – Doubly Linked List.

UNIT - II: STACK AND QUEUES
Stack: Basic Stack Operations – Stack Linked List Implementation – Stack Applications – Reversing Data, Postponement – Infix to Postfix Transformation, Evaluating Postfix Expressions. Queue: Queue operations – Queue Linked List Design – Queuing Theory – Queue Applications- Queue Simulation.

UNIT - III: TREES
Basic Tree Concepts: Terminology – Tree Representation – Binary Trees – Binary Tree Traversal – Expression Trees – Binary Search Trees.

UNIT - IV: SEARCHING AND SORTING
Searching: Hashed List Searches – Basic Concepts – Hashing Methods – Hashing Algorithm – Collision Resolution. Sorting: Internal Sort: Shell Sorts – Quick Sort- Heap Sort. External Sorts: Merging Ordered Files – Merging Unordered Files.

UNIT - V: GRAPHS
Graphs: Terminology – Operations – Graph Storage Structures – Graph Algorithms – Networks – Minimum Spanning Tree – Shortest Path Algorithm.

3. TEXTBOOK
1) E.Balagurusamy, "Programming in ANSI C", Seventh Edition, McGraw Hill Education Private Limited, NewDelhi: 2017.
   Unit – I   :   Ch 7 (Arrays)
2) Richard F. Gilberg and Behrouz A. Forouzan,"Data structures: A pseudo code Approach with C", Second Edition, 2018.
   Unit – I   :   Ch 5.1, 5.2 (Linked List)
   Unit – II   :   Ch 3.1, 3.2, 3.5, 4.1 – 4.5
   Unit – III :   Ch 6.1, 6.2, 7.1, 7.2
   Unit – IV   :   Ch 13.1, 13.2, 13.3, 12.1 – 12.5

Unit – V : Ch 11.1 – 11.4, 11.6

4. REFERENCES

1) Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Pearson Education, 2006.
2) Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, "Fundamentals of Data Structures in C++", 2nd Edition, Universities Press (India) Pvt.Ltd, 2009.

5. WEB REFERENCES

Online Tutorial
- www.cyberdim.com/vin/learn.html
- www.eecs.wsy.edu
- www.wrox.com/store/cerfinet.com

Online Quiz
- https://www.tutorialspoint.com/data_structures_algorithms/data_structures_algorithms_online_quiz.htm
- http://quiz.geeksforgeeks.org/data-structure/

Online Compiler
- http://withoutbook.com/OnlineTestStart.php?quizId=2
- https://www.wiziq.com/online-tests

6. SUPPLEMENT LEARNING
- Time and space complexity
- Eight Queens Problem
- AVL Trees
- Advanced Sorting concepts
- Abstract Data Type

Semester – III   **4 Hours/3 Credits**

ELECTIVE – I ANGULAR JS

1. COURSE OBJECTIVES
- To helps the reader understand how Angular JS differs from other frameworks
- To set up a test environment for Angular JS
- To shows why Angular JS is a better framework for building modern web applications and websites
- To working on a functional application and implement testing
- To covers search engine optimization as it relates to Angular JS applications and websites.

2. COURSE OUTLINE

UNIT - I: INTRODUCTION TO ANGULAR JS

Introduction to Angular JS - JavaScript Client-Side Frameworks - Single-Page Applications - Bootstrapping the Application - Dependency Injection - Angular JS Routes - HTML5 Mode - Modern Search Engines - Angular JS Templates - Angular JS Views (MVC) - Angular JS Models (MVC) - Angular JS Controllers (MVC) - Controller Business Logic - Integrating Angular JS with Other Frameworks - Testing Angular JS Applications

UNIT - II: IDE AND ANGULAR JS PROJECTS

The IDE - Editing the HTML Code - Editing the JavaScript Code - Creating the Templates-Running the Applications - Testing Angular JS Applications in the IDE – JsTestRunner - Karma Test Runner - Protractor

UNIT - III: MVC AND ANGULAR JS

Angular JS Controllers – JS Test Drivers – Testing with Karma – End-to-End Testing with Protractor – Angular JS Models – Services and Business Logic – Angular JS Directives

UNIT - IV: ANGULAR JS VIEWS AND BOOTSTRAP

Angular JS Templates - Creating the Blog Project - Adding a New Blog Controller - Adding a New Blog Template- Twitter Bootstrap - Adding a Bootstrap Menu - Adding Mock Blog Data - Using CSS3 to Style the Page - Adding Styles and Presentation Logic - Viewing the Blog Post - Running the Blog Application – Angular JS and REST Services

UNIT - V: ANGULAR JS SECURITY AND SEO

Authentication - Adding a Login Service - Adding a Login Controller - Security Modifications to Other Controllers - Adding a Logout Controller - Adding a Login Template - Adding New Routes - Adding a Logout Link - Running the Blog Application – MEAN Cloud and Mobile – Angular JS and SEO

3. TEXTBOOK
1) Ken Williamson (O'Reilly). "Learning Angular JS", by Copyright 2015 Ken Williamson.
   Unit – I: Ch. 1
   Unit – II: Ch. 2
   Unit – III: Ch. 3, 4, 7, 8, 9
   Unit – IV: Ch. 5, 6
   Unit – V: Ch. 10, 11, 12

4. REFERENCES
- Asim Hussain, "Angular: From to Practice". CodeCraft, 1st Edition, 2017

5. WEB REFERENCES
- https://angularjs.org
- https://docs.angularjs.org
- https://www.w3schools.com/angular

6. SUPPLEMENT LEARNING
- Moderate knowledge of HTML, CSS and JavaScript
- Basic MVC Concepts
- JavaScript Events, Functions and Error Handling

Semester – III   **4 Hours/3 Credits**

ELECTIVE – I: OBJECT ORIENTED ANALYSIS AND DESIGN

1. COURSE OBJECTIVES
- To understand the diagrams UML.
- To prepare the students to draw class modeling diagrams.
- To make the students to understand the importance of state modeling diagrams.
- To become knowledgeable in interaction modeling diagrams.
- To understand the basic concept of system conception and design.

2. COURSE OUTLINE

UNIT – I: MODELING IN GENERAL
Introduction to OO development - Modeling Concepts: Modeling – Abstraction - The Three Models – Overview of Unified Modeling Language and introduction to UML diagrams. Class Modeling: Object and Class Concepts – Link and Association - Inheritance - Advanced Class Modeling: Advanced Object & Class Concepts - Association Ends -N-ary Associations – Aggregation – Abstract Classes – Multiple Inheritance –Metadata – Reification – Constraints - Derived Data – Packages.

UNIT – II: STATE MODELING
State Modeling: Events – States – Transitions & Conditions - State diagrams - State Diagram Behavior - Advanced State Modeling: Nested State Diagrams - Nested States – Signal Generalization – Concurrency - Sample State Model - Relation of Class & State Models.

UNIT – III: INTERACTION MODELING
Interaction Modeling: Use Case Models – sequence Models – Activity Models – Advanced Interaction Modeling: Use Case Relationship – Procedural sequence Models – Special Constructs for Activity Models.

UNIT – IV: SYSTEM ANALYSIS AND DESIGN

Process Overview: Development Life Cycle – System Conception : Devising a System Concept – Elaborating a Concept – Preparing a problem statement. System Design : Overview of system Design – Estimating performance – Making a Reuse plan – Breaking a system into Subsystems – Identifying Concurrency – Allocation of Subsystems – Management of Data Storage – Handling Global Resources – Class Design.

UNIT – V: IMPLEMENTATION

Overview of implementation – fine-tuning classes- fine tuning generalizations – realizing associations – testing – Databases: Introduction – Implementing structure basic and advanced – implementing functionality – object oriented databases.– Star UML (Open Source)

3. TEXTBOOK

1) Michael Blaha and James Rumbaugh, "Object-Oriented Modeling and Design with UML", Prentice Hall of India Private Limited, New Delhi,2006.

        Unit– I   **: Ch. 1 – 4**
        Unit– II   **: Ch. 5 – 6**
        Unit– III   **: Ch. 7 – 8**
        Unit– IV   **: Ch. 10, 11-15**
        Unit– V   **: Ch. 17, 19**

4. REFERENCES

1) Ali Bahrami, "Object-oriented Systems Development using UML", McGraw Hill, Boston, 1999.
2) Satzinger Jackson Burd, "Object Oriented Analysis and Design", First Edition 2005.
3) Ivan Jacobon, Christerson Johnson, "Object Oriented Software Engineering", Fifth Edition, Pearson publication, 2000.

5. WEB REFERENCES

  Online Tutorial
- http://dev.tutorialspoint.com/object_oriented_analysis_design/index.htm
- http://ooaduml.com/
- https://onlinecourses.nptel.ac.in/noc16_cs19/preview

  Online Quiz
- https://gcc.gnu.org/onlinedocs/
- http://interviewquestionsanswers.org/quiz/Designing/Object-Oriented-Analysis-and-Design-OOAD

  StarUML Tool
- https://staruml.io/

6. SUPPLEMENT LEARNING

- Domain Analysis
- Application Analysis
- Databases
- Iterative Development
- Legacy Systems

ELECTIVE - I: SYSTEM ANALYSIS AND DESIGN

1. COURSE OBJECTIVES

- To learn the system development design strategies.
- To understand structured analysis development methods.
- To know computer input and output design strategies.
- To design online dialogue and auxiliary storage devices.
- To understand the Systems engineering and quality assurance concepts.

2. COURSE OUTLINE

UNIT – I: INTRODUCTION TO SYSTEM ANALYSIS AND DESIGN
Introduction to Information System Development: System Analysis and design- Business system concepts – Categories of Information systems – System Development Strategies - Managing the application development portfolio.

UNIT – II: SYSTEM REQUIREMENT AND STRATEGIES
Tools for determining system requirement: Requirements determination – Fact finding techniques Tools for documenting procedure and decision. Structured Analysis development strategies: Structured analysis – Developing Data flow diagram. Computer Aided systems tools: Role of tools – Categories of automated tools – CASE Tools – Benefits of CASE.

UNIT – III: DESIGN TRANSITION
The Analysis to design transition: Specifying application requirements – Objectives in designing Information systems – Features - Design of computer output: How to identify computer Output needs – Designing visual Display output. Design of input and control: What concerns guide input design – Capturing data for input – Input validation.

UNIT – IV: DESIGN OF ONLINE DIALOGUE AND AUXILIARY STORAGE DEVICES
Design of online dialogue: Online difference – Interface – Designing dialogue – Dialogue strategy – Data entry dialogues- Design of files and use of auxiliary storage devices: Basic file terminology – Data structure Diagrams – Types of files – Methods of file organization.

UNIT – V: SYSTEMS ENGINEERING AND QUALITY ASSURANCE

Systems engineering and Quality assurance: Design objectives – Program structure charts – Design of software – Managing Quality assurance – Managing testing practices. Managing system implementation: Training Conversion – post Implementation review, Managing information systems development: Estimation and management of development time – Estimation Personnel and development management. Hardware and Software selection: Hardware selection – Software Selection.

3. TEXTBOOK
1) James A.Senn, "Analysis and Design of Information Systems", Second Edition, TMH, New Delhi.

Unit – I	**:**	**Ch. 1**
Unit – II	**:**	**Ch. 3 – 6**
Unit – III	**:**	**Ch. 7 – 9**
Unit – IV	**:**	**Ch. 10, 11**
Unit – V	**:**	**Ch. 14 – 17**

4. REFERENCES
1) I.T. Hawryszkiewycz, "Introduction to System Analysis and Design", Third edition, Prentice Hall India, New Delhi.
2) Elias M. Awad, "System Analysis and Design", Second edition, Galgotia Publications (P) Ltd., 1999.

5. WEB REFERENCES
Online Tutorial
- www.w3computing.com/systemsanalysis/
- www.tutoruniverse.com/system-analysis-design-online-tutoring.html

Online Quiz
- www.indiabix.com › Engineering › Computer Science
- http://withoutbook.com/OnlineTestStart.php?quizId=42

6. SUPPLEMENT LEARNING
- Web based Development Design
- Structured Analysis and Design
- Temporal Semantic Data Models
- Financial Information System Design
- System Security Analysis and Design

Semester – III   **2 Hours/2 Credits**

PRACTICAL -III - DATA STRUCTURES USING C

1) Matrix Representation
2) Linked List Representation
3) Doubly Linked List Representation
4) Stack Representation
5) Queue Representation
6) Binary Tree Representation

7) Tree Traversal

8) Searching Algorithms

9) Sorting Algorithms

10) Graph Representation

PRACTICAL-IV: PROGRAMMING WITH JAVA

1) Data types, variables, Control Statements, loops

2) Arrays

3) Class and Objects

4) Constructors

5) Inheritance and Interface

6) Exception Handling

7) Applet: Labels, textbox, button, list box, panels.

8) SWING Containers: Panel, tabbed pane, split pane, scroll pan, desktop pane, tool bar

9) SWING controls: Label, button, text box, radio button, progress bar, check box, combo box, group box

10) SWING Menu Controls: Menu, file chooser, color chooser, Dialog, frame, option pane.

SOFTWARE ENGINEERING

1. COURSE OBJECTIVES
- To Understand the Software Engineering Practice and Process Models.
- To Understand Software Process Modeling Concepts.
- To know the concept of Architectural Design method in Software Engineering.
- To understand Component based software Engineering.
- To know the various methods of Reengineering.

2. COURSE OUTLINE

UNIT – I: INTRODUCTION TO SOFTWARE ENGINEERING
The Nature of Software: Defining Software – Software Application Domains – Legacy Software. Software Engineering – Software Engineering Practice: The Essence of Practice –

General Principles. - Software Myths - Prescriptive Process Models: The Waterfall Model – Incremental Process Models – Evolutionary Process Models – Concurrent Models – Personal and Team Process Models: Personal Software Process – Team Software Process.

UNIT – II: SOFTWARE PROCESS AND REQUIREMENTS MODELING
Introduction to Agile - Agility and the cost of Change – Agile Process: Agility Principles – The Politics of Agile Development. Requirements Analysis: Overall Objectives and Philosophy – Analysis Rules of Thumb – Domain Analysis – Requirements Modelling Approaches. Data Modelling Concepts: Data Objects – Data Attributes – Relationships. Requirements Modeling Strategies – Flow Oriented Modeling: Creating a Data Flow Model – Creating Control Flow Model.

UNIT – III: ARCHITECTURAL DESIGN
Design Concepts: Abstraction – Architecture – Patterns – Separation of Concerns – Modularity. The Design Models: Data Design Elements – Architectural Design Elements – Interface Design Elements – Component Design Elements. Software Architecture: Introduction to Architecture – Importance of Architecture – Architectural Descriptions – Architectural Decisions. Architectural Design: Representing the system in Context – Defining Archetypes – Refining the Architecture into Components.

UNIT – IV: COMPONENT BASED SOFTWARE ENGINEERING
Introduction to Component: An Object Oriented View – The Traditional View – A Process Related View. Designing Traditional Components: Graphical Design Notation – Tabular Design Notation – Program Design Language. Component Based Development: Domain Engineering – Component Qualification, Adaptation, and Composition – Analysis and Design for Reuse – Classifying and Retrieving Components.

UNIT - V: RISK MANAGEMENT AND REENGINEERING
Software Risks – Risk Identification: Assessing Overall Project Risk – Risk Components and Drivers. Risk Projection: Developing a Risk Table – Assessing Risk Impact. Software Maintenance – Software Supportability – Reengineering - Business Process Reengineering: Business Processes – A BPR Model. Software Reengineering: Software Reengineering Process Model – Software Reengineering Activities.

3. TEXTBOOK
1) Roger S. Pressman, "Software Engineering A Practitioners Approach", Mc Graw Hill Education (India), 7th Edition, 2014

Unit I	:	**Ch 1.1 – 1.6, 2.3, 2.6**
Unit II	:	**Ch 3.1 – 3.3, 6.1, 6.4, 7.1, 7.2**
Unit III	:	**Ch 8.3, 8.4, 9.1, 9.4**
Unit IV	:	**Ch 10.1, 10.5, 10.6**
Unit V	:	**Ch 28.2 – 28.4, 29.1 – 29.5**

4. REFERENCES
1) Rajib Mall, "Fundamentals of Software Engineering", PHI Learning Pvt Ltd., New Delhi, 2009.
2) K.L. James, "Software Engineering", PHI Learning Pvt Ltd., New Delhi, 2009

5. WEB REFERENCES
Online Tutorial

- www.tutorialspoint.com/software_engineering/
- www.tutorialspoint.com/listtutorials/software-engineering/1

Online Quiz
- http://highered.mheducation.com/sites/0072853182/student_view0/chapter1/multiple_choice_quiz.html
- www.tutorialspoint.com/listtutorials/software-engineering/1

Online Compiler
- www.csa.iisc.ernet.in/~cplse
- www.genomecompiler.com

6. SUPPLEMENT LEARNING
- Project Management
- Real Time Software Design
- Software Revolution
- Process Improvement
- Critical Systems Validation

Semester – IV   **4 Hours/3 Credits**

ENTERPRISE APPLICATIONS USING .NET

1. COURSE OBJECTIVES
- To know the differences between desktop and web application.
- To create and manipulate GUI components in C#.
- To configure an asp.net application.
- To create ASP.Net applications using standard .net controls.
- To develop a data driven web application.
- To connect the data sources and managing them.

2. COURSE OUTLINE

UNIT - I: INTRODUCTION TO C#
Introduction to .NET – Features of C# - Data Types – Value Types – Reference Types - Variables and Constants – Declaring – Assigning values – variables of nullable types – Operators – Type Conversions – Implicit and Explicit Type Conversions – Arrays – Single Dimensional and Multidimensional – Control Flow Statements – Selection – Iteration and Jump – Classes and Objects – Access Modifiers – Defining a Class – Variables – Properties and Methods – Creating Objects – Inheritance – Polymorphism- Constructor and Destructors.

UNIT - II: WINDOWS FORMS
Windows Forms – Form Class – Common Operations on Forms – Creating a Message Box – Handling Events – Mouse Events – Keyboard Events – Common Controls in Windows Forms – Label – TextBox – Button – Combo Box – List Box – Check Box – Radio Button – Group Box – Picture Box – Timer – Open File Dialog – Save File Dialog – Font Dialog – Color Dialog – Print Dialog – Tree View – Menu.

UNIT – III: WEB FORMS
Setting up ASP.NET and IIS - .NET Architecture - IIS manager - Creating a Virtual Directory- Virtual Directories and Applications - Folder Settings - ASP.NET Applications – File Types –

The bin Directory Application Updates – A Simple Application - The Page Lifecycle. – Input Controls – Display Controls – Action Controls – Selection Controls

UNIT –IV: VALIDATION AND RICH CONTROLS
Validation and Rich Controls – The Calendar Control – Formatting the Calendar – Restricting Dates – The AdRotator – Validation Controls – Validation Process Validation Classes – Server Side Validation – Manual Validation – Understanding Regular Expressions – Literals and Meta characters – Finding a Regular Expression.

UNIT-V: DATA ACCESS
About ADO.NET-Data objects-Simple Data access – Simple Data Updates – Creating a Connection – Defining a Select Command – Using a Command with a DataReader – Updating Data – Selecting Multiple Tables – Grid View – Reporting Plugins.

4. TEXTBOOKS
1) Kogent Solutions, " C# 2008 Programming Black Book", Dream Tech Press, New Delhi, Platinum Edition, 2009
   Unit – 1: Ch. 3 - 6
   Unit – II: Ch. 8

2) Mathew MacDonald, "ASP.NET: The Complete Reference", Tata McGraw Hill Publishing Company Ltd., New Delhi 2018.
   Unit – III: Ch. 7
   Unit – IV: Ch. 9
   Unit – V: Ch. 13

4. REFERENCES
1) Rebecca M.Riordon, "Microsoft ADO .Net 2.0 Step by Step", Prentice Hall of India Private Limited, New Delhi, 2007.
2) Vikas Gupta , "Comdex .NET Programming " , Dream Tech Press, New Delhi, 2011.
3) David S.Platt , "Introducing Microsoft .Net", Prentice Hall of India(Private) Limited, Third Edition, New Delhi, 2006.
4) Stephen Walther," ASP.NET 2.0 Unleashed", Second Edition, Pearson Education, 2005.

5. WEB REFERENCES
- http://csharp.net-tutorials.com/index.php
- http://csharp.net-tutorials.com/classes/introduction/
- http://www.homeandlearn.co.uk/csharp/csharp.html
- http://www.indiabix.com/c-sharp-programming/questions-and-answers/
- https://www.wiziq.com/online-tests/43860-c-basic-quiz
- http://www.withoutbook.com/OnlineTestStart.php?quizId=71
- http://www.compileonline.com/compile_csharp_online.php
- http://www.ideone.com
- http://www.careerride.com/test.aspx?type=ASP.NET

6. SUPPLEMENT LEARNING
- ASP.NET Administrative Tasks
- AJAX extensions

- Working with XML data
- WCF
- SQL Basics

RELATIONAL DATABASE MANAGEMENT SYSTEM

1. COURSE OBJECTIVES
- To understand the basic concepts of Database and Data Models.
- To learn how to implement the query language in database.
- To understand the advance features query language used to design an efficient database
- To know database design models exist.
- To understand the consequences of bad database design and how it can be overcome.

2. COURSE OUTLINE

UNIT – I: BASIC CONCEPTS AND DATA MODELS
Basic Concepts: Data modelling for database - The three level architecture proposal for DBMS – Components of DBMS - Advantage and Disadvantage of a DBMS. Data Models: Data Models Classification - Entity Relationship Model – Relational Data Model – Network Data Model - Hierarchical Model - Comparison.

UNIT – II: INTRODUCTION TO SQL
Overview of SQL Query Language – SQL Data Definition – Basic Structure of SQL Queries – Additional Basic Operations – Set Operators – Null Values – Aggregate Functions – Nested Sub queries – Modification of the Databases.

UNIT – III: ADVANCED SQL
Join Expressions - Views – Integrity Constraints – Authorization – Stored Procedures and Functions – Indexing: Basic Concepts.

UNIT – IV: DATABASE DESIGN AND E-R MODEL
Overview of the design process – The Entity-Relationship Model – Constraints – Entity – Relationship – Entity-Relationship Diagrams – Entity Relationship design issues – Extended E-R Features – Other aspects of Database Design.

UNIT – V: RELATIONAL DATABASE DESIGN
Features of Good Relational Designs – Atomic Domains and First Normal Form – Decomposition using Functional dependencies – Decomposition using Functional Dependencies – Decomposition using Multivalued Dependencies – More Normal Forms.

3. TEXTBOOKS
1) Bipin C Desai, "An Introduction to Database System", Galgotia Publications Pvt.Ltd, New Delhi 1999.

UNIT – I : Ch.1.1, 1.4 - 1.6, 2.3 - 2.4 & 2.6 - 2.9

2) Abraham Silberschatz , Henry F Korth, S Sudharshan , "Database System Concepts" MC Graw Hill, 6th Edition 2013.

UNIT – 2 : Ch. 3, 4
UNIT – 3 : Ch. 4.1, 4.2, 4.4, 4.6, 5, 11.1
UNIT – 4 : Ch. 7
UNIT – 5 : Ch. 8

4. REFERENCES

1) Peter Rob, Carlos Coronel, "Database Systems – "Design, Implementation and Management"c, Galgotia Publicaitons.
2) C.J. Date, "Introduction to Database System", Vol 1, Narosa Publishing House, New Delhi.
3) S. K. Singh, "Database Systems", Third Edition. 2009.
4) Ramakrishnan. Gehrke, "Database Management Systems", International Edition, 2003.
5) Rajeshkhar Sunderraman, "Oracle 8 Programming A Primer", Addition Wesley Publication, New Delhi, 2000.

5. WEB REFERENCES
Online Tutorial
- https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
- http://searchoracle.techtarget.com/tutorial/Learning-Guide-RDBMS-fundamentals

Online Quiz
- https://www.quia.com/quiz/164512.html
- https://www.wiziq.com/online-tests/22152-rdbms-concepts

Online Compiler
- https://www.tutorialspoint.com/execute_sql_online.php
- https://kripken.github.io/sql.js/GUI/

6. SUPPLEMENT LEARNING
- SQL Wild cards
- Temporary Tables
- Clone Tables
- Using Sequences
- Handling Duplicates

Semester – IV   **4 Hours/4 Credits**

EMERGING COMPUTING PARADIGM

1. COURSE OBJECTIVE
- To learn the benefits of E-Commerce and the features available in e-business.
- To introduce the basics of Block Chain and its applications.
- To know and implement content management system and various CMS models exist.
- To know and understand machine learning and its different categories of algorithms.
- To understand the basics and uses of Artificial Intelligence System and quantum computing.

2. COURSE OUTLINE

UNIT I : E-COMMERCE
Introduction: E-commerce as Business need-commerce Types, Advantages, Disadvantages, e-Commerce Architecture, Internet Payment Systems - Characteristics - 4C Payment Methods - SET Protocol for Credit Card Payment - E-Cash,E-Check - Overview of Smart Card

UNIT II : BLOCK CHAIN
Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain – Distributed Consensus – Crypto currency.

UNIT III : CONTENT MANAGEMENT SYSTEM
The Basics : Content, content management and content management system – Types of content management system – Why to use CMS – Do's and don'ts of CMS - Four acquisition models of CMS: open-source, commercial on-premise, commercial as a service, building own model - Tools for CMS. **Case Study: Any one Tool (**Wordpress, Joomla, Drupal)

UNIT IV : MACHINE LEARNING
INTRODUCTION Machine learning -Examples of Machine learning applications - Learning Associations - Classification – Regression - Unsupervised Learning - Reinforcement Learning-Supervised learning: Learning a class from Examples – Regression - Model Selection and Generalization Case Study: Familiarity with R tool and Python programming language and libraries

UNIT V: ARTIFICIAL INTELLIGENCE AND QUANTUM COMPUTING
Introduction- Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents. Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Avoiding Repeated States, Searching with Partial Information – Introduction to Quantum Computing.

3. REFERENCE BOOKS

1) Bharat Bhaskar, Electronic Commerce; Framework, Technology and Application, 4th Edition, McGraw Hill Education, 2006.
2) Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press (July 19, 2016).
3) Deane Barker, Web Content Management: System, Features and Best Practices, 1st Edition, O'Reilly Publication.
4) Ethem Alpaydin, "Introduction to Machine Learning", The MIT Press, September 2014, ISBN 978- 0-262-02818-9.
5) Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Publication, 2nd Edition, 2002.
6) P Kaye, R Laflamme and M Mosca, "An Introduction to Quantum Computing", Oxford University Press, 2007.
7) Martin Kutz, Introduction to E-Commerce, bookboon.com, 1st Edition, 2016.
8) Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press (MA) 2012.

9) Jeff Heaton, Artificial Intelligence for Humans-Fundamental Algorithms, Create space Independent Pub; 1st edition, 2013.

10) Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann 1998.

4. WEB REFERENCES

- https://www.tutorialspoint.com/e_commerce/e_commerce_tutorial.pdf
- https://www.ncertbooks.guru/e-commerce-full-notes/
- https://www.w3schools.in/wordpress-tutorial/introduction-to-content-management-system-cms/
- https://www.tutorialspoint.com/management_information_system/content_management_system.htm
- https://www.javatpoint.com/blockchain-tutorial
- https://www.tutorialspoint.com/blockchain/index.htm
- https://www.javatpoint.com/machine-learning
- https://www.mygreatlearning.com/blog/machine-learning-tutorial/
- https://www.javatpoint.com/artificial-intelligence-tutorial
- https://www.tutorialspoint.com/artificial_intelligence/index.htm
- https://www.edn.com/the-basics-of-quantum-computing-a-tutorial/
- https://www.geeksforgeeks.org/introduction-quantum-computing/

5. SUPPLEMENT LEARNING

- Security and Encryption
- Limitations in Crypto currency
- Web Development using CMS
- Regression and Classification Algorithms
- Languages and Tools used for Artificial Intelligence

Semester – IV   **2 Hours/2 Credits**

PRACTICAL – V: ENTERPRISE APPLICATIONS USING .NET

1) Variables and Control Structures and Arrays

2) OOP Concepts

3) Windows Form Controls (Label, Text, Button, Check Box, Radio, List, Combo, Timer, Group Box, Picture Box, Menu)

4) Sample ASP.NET Application

5) Web Controls (Input and Display)

6) Web Controls (Action and Selection)

7) Validation Controls

8) Rich Controls

9) Data Access

10) Grid View (Reporting)

PRACTICAL – VI: RELATIONAL DATABASE MANAGEMENT SYSTEM

SQL

1) DDL (Create, Alter, Drop, Rename) and DML (Insert, Update, Delete)

2) Single row functions and Aggregate Functions using SELECT

3) TCL (Commit, SavePoint, RollBack) and DCL (Grant, Revoke)

4) Using Constraints, Subqueries and Views

5) Joins

PL/SQL – Stored Procedures and Functions

1) Create, Execute and Drop Procedure

2) Procedures with Variables and Constants

3) Procedures with Control Structures

4) Procedures with Exceptions

5) Functions

PROGRAMME STRUCTURE FOR COMPUTER APPLICATIONS 2021-2022 ONWARDS

III Year (2021-2022 Batch)

Sem	Subject Code	Part	Subject	L	P	CD	CA	SEM
V	CA514	III	Software Testing and Quality Assurance	4		4	50	50
	CA515	III	Computer Graphics	4		4	50	50
	CA516	III	Enterprise Applications using JAVA	5		4	50	50
	CA517	III	Programming with Python	5		4	50	50
	PCA505	III	Practical - VII - Enterprise Applications using JAVA		6	4	50	50
	PCA506	III	Practical - VIII - Programming with Python		4	4	50	50
	NCA504	IV	Non Major Elective I : Introduction to Information Technology	2		1	-	100
		VI	Self Study Paper I- Inplant Training*	-		1*		
				20	**10**	**25 + 1***		
VI	CA612	III	Cloud Computing	4		4	50	50
	CA613	III	Mobile Application Development	5		4	50	50
	CA614	III	Web Programming using PHP	5		5	50	50
	CA615A /B/C	III	Discipline Specific Elective II	4		3	50	50
	PCA608 J	III	Project Work		6	4	-	100
	PCA607	III	Practical IX - Mobile Application Development and PHP		4	4	50	50
	NCA604	IV	Non Major Elective – II : Multimedia	2		1	-	100
		VI	Self Study Paper II: NPTEL*	-		1*		
				20	**10**	**25+1***		

III BCA

Semester – V   **4 Hours/4 Credits**

SOFTWARE TESTING AND QUALITY ASSURANCE

1. COURSE OBJECTIVES
- To understand and describe the different types of testing tools.

- To appreciate the need, importance and significance of mapping
- To apply the concept of debugging and testing, with software development lifecycle.
- To apply overall knowledge for relating better conceptualization
- To identify the fundamental of software testing and quality assurance.

2. COURSE OUTLINE

Unit - I: SOFTWARE TESTING FUNDAMENTALS
Introduction – Software testing perspective – Effective Software Testing – Types of Testing – Principles of software Testing – Testing and Debugging.

Unit - II: STATIC TESTING
Principles of Static Testing – Static testing perspective – Manual Techniques – Automated Techniques – Static Vs Dynamic Testing.

Unit - III: BLACK BOX TESTING
Black box techniques – Equivalence partitioning – Boundary Value Analysis – Robustness Testing – Syntax Testing – Finite State Testing. Case study : Selenium

Unit - IV: WHITE BOX TESTING
White Box Techniques – White Box Modeling – Basis Path Testing – Control Structure Testing – Mutation Testing – Gray –Box testing.

Unit - V: SOFTWARE QUALITY
The Theory of Software quality – Hierarchical models of quality: The hierarchical models of Boehm and McCall – How the quality criteria interrelate – A practical Evaluation.

3. TEXTBOOKS
1) K. Mustafa R. A. Khan, "Software Testing Concepts and Practices", Narosa Publications.2009.
   - **Unit – I: Ch. 1**
   - **Unit – II: Ch. 3**
   - **Unit – III: Ch. 4**
   - **Unit – IV: Ch. 5**
2) Stephan H. Kan, "Metrics and Models in Software Quality Engineering ", Pearson Education (Singapore) Pvt.Ltd., 2002.
   - **Unit – V: Ch. 2**

4. REFERENCES
1) Edward Kit, "Software Testing in the Real World – Improving the process", Pearson Education, 1995.
2) Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education (Singapore) Pvt. Ltd., 2002.
3) Allan C. Gillies, "Software Quality: Theory and Management", Thomson Learning, 2003.

5. WEB REFERENCES
   Online Tutorial

- https://www.tutorialspoint.com/software_testing_dictionary/web_application_testing.htm
- https://www.cigniti.com/blog/list-of-top-100-software-testing-tools/

Online Quiz

- https://www.guru99.com/software-testing-tool-quiz.html

6. SUPPLEMENT LEARNING
- Quality Management Plan
- Test Strategy
- Test Plan
- Test Cases
- Test driven development

Semester – V   **4 Hours/4 Credits**

COMPUTER GRAPHICS

1. COURSE OBJECTIVES
- To exemplify the major computer graphics application areas.
- To explain the operations of graphics hardware systems.
- To explain some classic 2D and 3D graphics algorithms.
- To create computer models of 2D and 3D objects using mathematical knowledge and skills.
- To implement the models using OpenGL and a high level program language C++.

2. COURSEOUTLINE

UNIT-I: OVERVIEW OF GRAPHICS SYSTEM
Rasters scan Displays - Random Scan Displays - Graphics software - Output primitives: Line drawing algorithms- Circle Generating algorithms- Filled Area Primitives- Character Generating Algorithm.

UNIT-II: 2D TRANSFORMATIONS
Two dimensional Transformations: Translation – Scaling – Rotation – Homogenous Representation- Inverse Transformation – Composite Transformation- Other Transformation Reflection – Shear.

UNIT-III: VIEWING AND CLIPPING
Viewing Pipeline – Window to Viewport Coordinate – Transformations clipping Operations- Point Clipping – Line Clipping – Polygon Clipping.

UNIT-IV: 3D TRANSFORMATIONS
User Dialogue – Input of Graphical Data – Interactive Picture Construction Techniques -Three dimensional display methods: parallel Projection - Perspective Projection - Depth Cueing - Visible line and surface identification -Three dimensional transformations: Translation – Rotation - Scaling.

UNIT-V: VISIBLE SURFACE DETECTION METHODS
Back Face Detection – Depth Buffer Method – A Buffer Method – Scan Line Method – Depth
Sorting Method.

3. TEXTBOOK

1) D. Hearn and M.P.Baker, "Computer Graphics C Version", Prentice Hall, Second Edition,2016(Reprint)

Unit-I	**:**	**Ch. 2.1, 2.7, 3.2, 3.5, 3.11, 3.14.**
Unit-II	**:**	**Ch. 5.1, 5.2, 5.3, 5.4.**
Unit-III	**:**	**Ch. 6.1, 6.3, 6.5, 6.6, 6.7, 6.8.**
Unit-IV	**:**	**Ch. 9.1, 11.1, 11.2, 11.3.**
Unit-V	**:**	**Ch. 13.2, 13.3, 13.4, 13.5, 13.6.**

4. REFERENCES

1) James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.
2) F.S. Hill, Computer Graphics using OPENGL, Second edition, Pearson Education, 2003.

5. WEB REFERENCES

Online Tutorial
- http://ebookily.net/doc/hearn-d-baker-p-computer-graphics
- http://www.cs.brandeis.edu/~cs155

Online Quiz
- http://www.eduzip.com/computer-science/computer-graphics.html

Online Compiler
- http://www.onlinecompiler.net/question&id=1240

6. SUPPLEMENT LEARNING

- Real Time Graphics
- Texture Bump Mapping
- Photo Realistic Graphics
- Image Based Rendering
- Visual Realism

Semester – V   **5 Hours/4 Credits**

ENTERPRISE APPLICATIONS USING JAVA

1. COURSE OBJECTIVES

- To acquire the basic knowledge required for building enterprise applications using JAVA.
- To understand the role of servlet in creating web based applications.
- To have the basic knowledge in Java Server Pages and its role in distributed system.
- To understand the advantages of Java Server Faces over Java Server Pages.
- To program in Java Server Faces framework.

2. COURSE OUTLINE

UNIT – I: OVERVIEW OF J2EE

J2EE and J2SE : J2EE – Distributive Systems: Real time transmission – software objects – web services – The Tier: Client, resources and components – accessing Services – J2EE Multi-tier architecture – Client tier implementation – web tier implementation – Enterprise JavaBeans Tier Implementation – Enterprise Information System Tier Implementation.

UNIT – II: SERVLETS - I
Servlet basics: structure – generating plain text – generating HTML – Servlet Packaging – Simple HTML building Utilities – Life cycle of a Servlet – Enumerations – Passing Parameters – Client request – server response – Retrieve values from HTML – methods – Cookies – Session Tracking – Filters – retrieve values from Java beans.

UNIT – III: SERVLETS – II
Database Access: CRUD – File uploading – page redirect – auto refresh – sending email – Packaging – debugging – Internationalization.

UNIT – IV: JAVA SERVER PAGES – I
Architecture – life cycle – benefits - syntax – directives – JSP Tags: Variables and Objects – Methods – Control Statements – Loops – Requesting String: Parsing other information - User session – Cookies – session objects.

UNIT –V: JAVA SERVER PAGES – II
Using Beans: JavaBean Tags – Scope - Database Access: CRUD – Fusing SQL Directly from JSPs – Inserting Data from JSPs – SQL and Beans

3. TEXTBOOKS
1) Jim Keogh, "The Complete Reference: J2EE", McGrawHill Education, 2015
   Unit – I : Ch. 1, 2
   Unit – IV: Ch 11
2) Marty Hall, Larry Brown, "Core Servlets and JavaServer Pages", Pearson Education Second Edition, 2008.
   Unit – II: Ch 3, 4
   Unit – IV : Ch. 17
   Unit – V : Ch.18-19.
3) C. Muthu, "Programming in JAVA", Thomson Learning, 2004.
   Unit – I : Ch. 20
   Unit – III: 19
4) Lame Pekowsky, "Java Server Pages", Pearson Education, 2004.
   Unit – V: Ch 3, 6

4. REFERENCES
1) James McGovern etl., "Java Web Services Architecture", Elsiver, 2005.

5. WEB REFERENCES
   Online Tutorial
   - http://www.tutorialspoint.com/servlets/
   - https://www.tutorialspoint.com/jsp/index.htm
   Online Quiz
   - https://www.tutorialspoint.com/jsp/jsp_questions_answers.htm
   - http://www.bullraider.com/quiz/servlet-and-jsp-quiz
   Online Compiler
   - https://www.onlinejspcompiler.com/

- www.tutorialspoint.com/execute_jsp_online.php

6. SUPPLEMENT LEARNING
- JSTL
- JAVA Mail API
- JMS – Building Message Applications
- Web Services
- JNDI and Directory Transactions

Semester – V   **5 Hours/4 Credits**

PROGRAMMING WITH PYTHON

1. COURSE OBJECTIVES
- To develop basic understanding of the basics of Python programming language.
- To learn core Python scripting elements such as data types and flow control structures.
- To design simple applications using Python.
- To enable the leaners to use the library files for graphical representation and visualization
- To design GUI application using Python.

2. COURSE OUTLINE

UNIT - I: OVERVIEW
Introduction to Python: Features of Python - Identifiers - Reserved Keywords - Variables - Comments - Indentation - Multi-Line Statements -Multiple Statement Group(suite) – Quotes - Input, Output and Import Functions –Operators - Data Types and Operations: Numbers- Strings - List- Tuples – Set- Dictionaries -Data type conversion. Flow Control: Decision Making – Loops – nested loops – control statements – Types of loops – list comprehensions – set comprehensions – dictionary comprehensions.

UNIT - II: OBJECT ORIENTED PROGRAMMING AND FILES
Define a Class - Instantiate an Object - Challenge: Model a Farm – Class and object - Attributes - Inheritance - Overloading - Overriding - Data hiding - Files and the File System . Working With File Paths in - Common File System -Challenge: Move All Image Files to a New -Reading and Writing Files -Read and Write CSV Data - Challenge: Create a High Scores List

UNIT – III: WORKING WITH DATABASE AND MODULES, PACKAGES
An Introduction to SQLite - Libraries for Working With Other SQL Databases Working With Modules - Working With Packages - Installing Third-Party Packages With pip - The Pitfalls of Third-Party Packages

UNIT – IV: INTERACTING WITH WEB AND SCIENTIFIC COMPUTING, GRAPHING
Scrape and Parse Text from Websites - Use an HTML Parser to Scrape Websites - Interact With HTML - Interact with Websites in Real Time - Use NumPy for Matrix Manipulation - Use Matplotlib for Plotting Graphs

UNIT – V: GRAPHICAL USER INTERFACES

Add GUI Elements With - Example App: PDF Page Rotator - Challenge: PDF Page Extraction - Introduction to Tkinter - Working With Widgets -Controlling Layout With Geometry Managers - Making Your Applications Interactive - Example App: Temperature Converter - Example App: Text Editor

3. TEXTBOOKS

1) Jeeva Jose and P. Sojan Lal, "Introduction to Computing and Problem Solving with Python", Khanna Book Publising Co. (P) Ltd., 2016.

   Unit – I : Ch 1, 2, 3

2) David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler, "Python Basics: A Practical Introduction to Python 3", 4th Edition, RealPython Publication.

   Unit – II: Ch 10, 12
   Unit – III: Ch 11,15
   Unit – IV: Ch 16, 17
   Unit – V: Ch 18

4. REFERENCES

1) Ch Satyanarayana, M Radhika Mani & B N Jagadesh, "Python Programming", Universities Press, 2018.

5. WEB REFERENCES

Online Tutorial
- www.learnpython.org/
- https://www.w3schools.com/python/

Online Quiz
- https://www.w3schools.com/python/python_quiz.asp
- https://realpython.com/quizzes/

Online Compiler
- https://www.w3schools.com/python/python_compiler.asp
- https://www.guru99.com/execute-python-online.html
- https://www.python.org/shell/
- https://onecompiler.com/python

6. SUPPLEMENT LEARNING
- Python in Data analytics
- Python and R
- Python in Machine Learning

Semester – V   **6 Hours/4 Credits**

PRACTICAL - VII - ENTERPRISE APPLICATIONS USING JAVA

1) Handling HTTPServlet

2) Working with Cookies

3) Working with Sessions

4) Reading Servlet Parameters using JavaBeans

5) Servlet with Database Connectivity

6) Reading JSP Parameters

7) JSP with Java Beans Components

8) Simple JSP Application

9) JSP Pages with tags

10) JSP with Database Connectivity

Semester – V   **4 Hours/4 Credits**

PRACTICAL - VIII - PROGRAMMING WITH PYTHON

1) Types of Operators

2) Numbers

3) Strings

4) List & Dictionaries

5) Tuples & Set

6) Flow Control

7) File Handling

8) Database programming

9) Web Interactions, Scientific computing and graphics

10) GUI Programms

Semester – V   **2 Hours/1 Credit**

NON MAJOR ELECTIVE - I: INTRODUCTION TO INFORMATION TECHNOLOGY

1. COURSE OBJECTIVES
- To understand the basic of computer, Evaluation of computers, Generation and basic computer organization.
- To understand the basic of number system and converting from one number system to another.
- To understand the basic of processor, memory and secondary storage device.
- To understand the basic of computer languages and characteristics of a good programming languages.
- To understands the basic concepts of input and output organization.

2. COURSE OUTLINE

UNIT – I: INTRODUCTION TO COMPUTER

Introduction: Characteristics of Computer – Evaluation of Computers – Computer Generation. Basic Computer Organization: Input and Output Unit – Storage Unit – ALU – CU – CPU – The System Concept.

UNIT – II: NUMBER SYSTEMS
Data types: Non-Positional Number Systems – Positional Number Systems, Binary, Octal and Hexadecimal Numbers – Converting from one Number system to another.

UNIT – III: PROCESSOR AND MEMORY
Processor: Central Processing Unit Memory: Main memory – Secondary Storage: Magnetic Tape, Magnetic Disks, Optical Disks, Memory storage Devices.

UNIT – IV: COMPUTER LANGUAGE
Computer Languages: Analogy with Natural Languages – Machine Languages – Assembly Languages – High Level Language – Object Orient Language – Some High Level Languages – Characteristics of a Good Programming Languages.

UNIT – V: INPUT / OUTPUT ORGANIZATION
Peripheral Devices – I/O interface – Asynchronous Data Transfer – Modes of Transfer – Direct Memory Access – Input Output Processor.

3. TEXTBOOKS
   1) Pradeep K.Sinha, Priti Sinha, "Computer Fundamentals", Sixth Edition BPB Publications.

Unit – I	:	Ch. 1 - 2
Unit - II	:	Ch. 3
Unit - III	:	Ch. 7 - 8
Unit – IV	:	Ch. 12

   2) Moris Mano M., Computer System Architecture, 3rd Edition, New Delhi: Pearson Prentice Hall, India, 2008.

   Unit – V :   Ch. 11.1 – 11.4, 11.6 – 11.7

4. REFERENCES
   1) William Stallings – "Computer Organization and Architecture" Eight edition, Pearson publication – 2010.
   2) Morris Mano, "Digital Login and Computer Design", Prentice Hall of India Private Limited, New Delhi:2001.

5. WEB REFERENCES
   Online Tutorial
   - http://www.tutorialspoint.com/computer_logical_organization/

   Online Quiz
   - http://www.sanfoundry.com/computer-organization-mcqs-direct-memory-access/

6. SUPPLEMENT LEARNING
   - Computer Ports
   - Networking

- Internet and Intranet
- Logical Conversion
- Mother Board

Semester – VI   **4 Hours/4 Credits**

CLOUD COMPUTING

1. COURSE OBJECTIVES
- To learn basic concepts in cloud computing.
- To understand various features of virtualization.
- To learn the basic architecture of cloud.
- To understand Aneka cloud application platform.
- To understand cloud platforms and its applications.

2. COURSE OUTLINE

UNIT – I : INTRODUCTION TO CLOUD COMPUTING
Cloud computing at a Glance – Historical Developments – Building cloud computing environments – Computing Platforms and Technologies.

UNIT – II : VIRTUALIZATION
Introduction – Characteristics of Virtualized Environments – Taxonomy of Virtualization Techniques – Virtualization and Cloud Computing – Pros and cons of Virtualization – Technology examples.

UNIT – III : CLOUD COMPUTING ARCHITECTURE
Introduction – Cloud Reference Model- Types of Clouds – Economics of Cloud – Open Challenges.

UNIT – IV: ANEKA-CLOUD APPLICATION PLATFORM AND THREAD PROGRAMMING
Framework overview – Anatomy of the Aneka Container – Building Aneka Clouds – Clouds – Cloud Programming and Management. – Programming applications with Threads – Multithreading with Aneka.

UNIT – V: CLOUD PLATFORMS IN INDUSTRY AND APPLICATIONS
Amazon Web Services – Google AppEngine – Microsoft Azure – Scientific Applications – Business and Consumer Applications.

3. TEXTBOOK
1) Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education (India) Private Limited, 2013.

Unit– I	**:**	**Ch. 1**
Unit –II	**:**	**Ch. 3**
Unit –III	**:**	**Ch. 4**
Unit –IV	**:**	**Ch. 5,6**
Unit-V	**:**	**Ch .9, 10**

4. REFERENCES

1) Rajkumar Buyya, James Broberg, Andrzej Goschinski, "Cloud Computing- Principles and Paradigms", John Wiley and Sons, Inc, New Jersey.
2) Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012

5. WEB REFERENCES

Online Tutorial

- https://www.tutorialspoint.com/cloud_computing/
- www.guru99.com/cloud-computing-for-beginners.html

Online Quiz

- www.javatpoint.com/cloud-computing-quiz
- www.proprofs.com › ... › Quizzes › Computer › Networking › Cloud Computing

6. SUPPLEMENT LEARNING

- Data Security in Cloud Computing
- Big Data Analytics
- Multitenant Technology
- Virtualization Technology
- Service Technology

Semester – VI   **5 Hours/4 Credits**

MOBILE APPLICATION DEVELOPMENT

1. COURSE OBJECTIVES

- To know the basis of Android application and development environment
- To able to develop simple and professional application
- To get into the creation of activities, intents and UI controls.
- To able to know the database connectivity using SQLite

2. COURSE OUTLINE

UNIT - I: INTRODUCTION TO ANDROID

History of Android Platform- Android APIs- Android Architecture Application Framework- Features of Android- Android Applications- Application Components - Manifest File- Downloading and Installing Android and Android SDK - Setting up Android Virtual and physical Device - Exploring the Development Environment - The Java Perspective Using Eclipse - DDMS Perspective - Command-Line Tools- Developing and Executing the First Android Application - Using Eclipse IDE to Create an Application - Running Your Application - Exploring the Application - Using Command - Line Tools.

UNIT – II: ACTIVITIES, INTENTS AND FRAGMENTS

Working with Activities- Creating an Activity- Starting an Activity – Managing the Life cycle of an Activity - Applying Themes and Styles to an Activity- Displaying a Dialog in the Activity - Hiding the title of the activity- Using Intents - Exploring Intent Objects- Exploring Intent

Resolution- Exploring Intent Filters - Resolving Intent Filter Collision - Linking the Activities Using Intent - Obtaining Results from Intent – Passing Data Using an Intent Object- Fragments - Hiding Title Bar and Screen Orientation - Fragment Implementation - Finding Fragments - Adding, Removing and Replacing Fragments - Finding Activity Using Fragment - Using the Intent Object to Invoke Built-in Application..

UNIT - III: UI USING VIEWS AND VIEW - GROUPS
Working with View Groups – Linear Layout – Relative Layout – Scroll Layout – Table Layout – Frame Layout – Tab Layout using the Action Bar – Working with Views – Text – Edit Text – Button – Radio Button – Check Box – Image Button – Toggle Button – Rating Bar – Binding Data with Adapter View Class – List View – Spinner – Gallery – Designing the Auto Text Complete View – Screen Orientation – Anchoring the Views of Current Activity – Handling UI Events – Handling User Interaction with Activities and Views – Specialized Fragments – List Fragment – Dialog Fragment – Preference Fragment – Creating Menus, Option Menus, Context Menu and Sub Menu.

UNIT - IV: HANDLING PICTURES AND MENUS WITH VIEWS AND STROING THE DATA
Working with Image Views – Displaying Images in the Gallery View – Displaying Images in the Grid View – Using the Image Switcher View- Designing Context Menu for Image View- Using the Analog-Clock and Digital Clock Views – Embedding Web Browser in an Activity - Notifying the User Creating the Toast Notification - Creating the Status Bar Notification- Creating the Dialog Notification - Introducing the Data Storage Options - Using Preferences - Using the SQLite Database Creating the Database - Executing the Database Operations.

UNIT - V: EMAILING, TELEPHONY AND SMS IN ANDROID
Building an Application to Send Email - Handling Telephony - Displaying Phone Information Application Receiving Phone Calls – Making Outgoing Phone Calls Application - Handling SMS Sending SMS Using SMS Manager - Sending SMS Using Intent - Receiving SMS Using the Broadcast Receiver Object- Role of Default SMS Providers - . Publishing Android Application: Export android application – Google play store registration.

3. **TEXTBOOK**
   1) Pradeep Kothari, "Android Application Development (with kitkat support) Black Book", Kogent Learning Solution Inc., Dreamtech Press India Pvt. Ltd, Wiley Publications. – 2018
      Unit – I: Ch. 2
      Unit – II: Ch. 3
      Unit – III: Ch. 4
      Unit – IV: Ch. 5, 6
      Unit – V: Ch. 7, 13, 17

4. **REFERENCES**
   1) Reto Meier ,"Professional Android Application Development",2009 Edition, Willy Publication.
   2) Zigurd Mednieks, Laird Dornin, G. Blake Meike,and Masumi Nakamura, "Programming Android", OReilly publications.
   3) Sayed Y. Hashimi, SatyaKomatineni, Dave MacLean, "Pro Android 2", 2010 Edition, Wiley publications.

5. WEB REFERENCES
Online Tutorial
- https://developer.android.com/training/basics/firstapp/index.html
- https://www.tutorialspoint.com/android/
- https://www.diygenius.com/how-to-learn-android-app-development-online

Online Quiz
- https://www.tutorialspoint.com/**android**/**android**_online_**quiz**.htm
- www.javatpoint.com/**android**-**quiz**

6. SUPPLEMENT LEARNING
- Building Mobile Applications using Xamarin
- Making the App as a commercial in play store

Semester – VI   **5 Hours/5 Credits**

WEB PROGRAMMING USING PHP

1) COURSE OBJECTIVES
- To understand the basic fundamental syntax and functions.
- To understand form processing and validation methods.
- To know file handling concepts.
- To understand basic MySQL functions.
- To implement PHP using XML functions.

2) COURSE OUTLINE

UNIT – I: FUNDAMENTALS OF PHP
Web server-Apache-PHP Intro-PHP Install-PHP Syntax-PHP Variables-PHP Echo / Print-PHP Data Types-PHP Strings - PHP Constants PHP Operators- Control structures-PHP Functions-Directory Functions-File System Functions-PHP ArraysPHP Sorting ArraysPHP Super global-String Functions-Date and Time Functions-Mathematical Functions-Miscellaneous Functions.

UNIT – II: PHP FORMS
Basic Form Processing (GET and POST Method) - PHP Form Handling - PHP Form Validation- PHP Form Required– URL-   E-mail-PHP Form Complete.

UNIT-III: PHP ADVANCE
PHP Arrays Multi-PHP Date and Time-PHP Include-PHP File Handling-PHP File Open/Read-PHP File Create/Write-PHP File Upload-PHP Cookies-PHP Sessions-PHP Filters-PHP Filters Advanced-PHP Error Handling-PHP Exception-COM-DOM-CURL-SOAP.

UNIT – IV: MYSQL
Introduction to MY SQL - The Show Databases and Table - The USE command - Create Database and Tables - Describe Table - Select, Insert, Update, and Delete statement - Some Administrative detail - Table Joins - Loading and Dumping a Database.

UNIT – V: PHP WITH DATABASE CONNECTION
PHP MySQL Functions -Connect-Create DB-Create Table- Insert Data-Get Last ID-Insert Multiple-Prepared-Select Data-Delete Data-Update Data-Limit Data-Table join-Database driven application.

3) TEXTBOOK

1) Julie C.Meloni, Sams, "Teach Yourself PHP, MySQL and Apache", Fourth Edition, Sams Publishing, New Delhi, 2008.

Unit – I	**:**	**Ch. 3 – 8, 10**
Unit – II	**:**	**Ch. 11**
Unit – III	**:**	**Ch. 12 – 6**
Unit – IV	**:**	**Ch. 15**
Unit – V	**:**	**Ch. 16**

4) REFERENCES

1) Luke Welling, Laura Thomson, "PHP and MySQL Web Development" Third Edition, Dorling Kinderly Pvt Ltd., New Delhi, 2006.
2) Julie Meloni, Matt Tellus, "PHP 6", Cengage Learning Inida Pvt Ltd, New Delhi, 2008.

5) WEB REFERENCES
Online Tutorial
- www.w3schools.com
- www.php.net
- www.phpclasses.org

Online Quiz
- http://www.w3schools.com/quiztest/quiztest.asp?qtest=PHP
- http://www.pskills.org/php.jsp

Online Compiler
- http://compileonline.com
- http://www.compileonline.com/execute_php_online.

6) SUPPLEMENT LEARNING
- Processing Buffered and Un buffered Queries
- SQL Injection Cheat Sheet
- Comparison Operators
- Security Concepts
- Memory Management in PHP

Semester – VI   **4 Hours/3 Credits**

ELECTIVE – II: BIG DATA ANALYTICS

1. COURSE OBJECTIVES
- To know the characteristics and types of digital data
- To learn the new big data database tools
- To understand the basics of data analytics language R
- To learn the data visualization methods available in R
- To learn and implement statistical analysis using R.

2. COURSE OUTLINE

UNIT – I: INTRODUCTION TO BIG DATA

Types of Digital Data – Introduction to Big Data: Characteristics of Data - Big data Analytics – Classification of Analytics – Top Challenges facing in Big Data – Data Sciences – Few Top Analytics Tools.

UNIT – II: NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION
NoSQL Databases: Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores – Tabular Stores – Object Data Stores – Graph Databases Hive – Sharding –-Hbase

UNIT – III: R Programming Basics
Overview of R programming, Environment setup with R Studio, R Commands, Variables and Data Types, Control Structures, Array, Matrix, Vectors, Factors, Functions, R packages.

UNIT – IV: Data Visualization using R
Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms,Boxplots,Bar Charts, Line Graphs, Scatterplots, Pie Charts.

UNIT – V: Statistical Analysis with R
Random Forest, Decision Tree, Normal and Binomial distributions, Time Series Analysis, Linear and Multiple Regression, Logistic Regression. CASE STUDY : Analyzing big data with twitter – Big data for E-Commerce Big data for blogs.

3. **TEXTBOOKS**
    1) Seema Acharya and Subhashini Chellappan, "Big Data And Analytics", Wiley Publications, 2015.
        Unit I - Ch. 1, 2 & 3
    2) David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.
        Unit II – Ch.4, 5, 6

    3) An Introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics. W. N. Venables, D.M. Smith and the R Development Core Team. Version 3.0.1 (2013-05-16).
        Unit III: Ch.1, 3, 4, 5, 6
        Unit IV: 8
        Unit V: 9,10
4. **REFERENCES**
    1) EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
    2) Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
    3) Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.
    4) Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012.
    5) Jared P Lander, R for everyone: advanced analytics and graphics, Pearson Education, 2013.

5. **WEB REFERENCES**

- <https://www.ibm.com/analytics/hadoop/big-data-analytics>
- <https://en.wikipedia.org/wiki/Big_data>
- <https://www.tutorialspoint.com/hadoop/index.htm#:~:text=Hadoop%20is%20an%20open%2Dsource,offering%20local%20computation%20and%20storage>
- <https://www.javatpoint.com/hadoop-tutorial>

6. SUPPLEMENT LEARNING
- No Sql Tools
- Hadoop Architecture
- Classification And Clustering
- Data Visualization Models
- Cloud Services used for Big Data

Semester – VI   **4 Hours/3 Credits**

ELECTIVE II: - CRYPTOGRAPHY AND NETWORK SECURITY

1. COURSE OBJECTIVES
- To understand the security need of security.
- To understand why network security is needed apart from application security.
- To explore various types of ciphers and encipherment techniques.
- To learning the basics of symmetric key cryptography.
- To understand the types of keys used in asymmetric key cryptography.

2. COURSE OUTLINE

UNIT I: INTRODUCTION
Introduction – The Need for Security –Security Approaches –Principles of Security–Security Services and Mechanisms – Attacks: General view – Technical – Practical side of attacks – Attacks on wireless networks – Programs that attack– Dealing with viruses.

UNIT II: NETWORK SECURITY
Basic Concepts–Firewalls– IP Security: Overview – Authentication header – Encapsulating security payload – Key management– Virtual Private Network – Intrusion: Intruders – Audit Records – Intrusion detection –Distributed intrusion detection – Honeypots.

UNIT III: CRYPTOGRAPHY TECHNIQUES
Basic terms – Plain text and Cipher text – Transposition Techniques – Encryption and Decryption – Symmetric and Asymmetric Key Cryptography – Steganography – Key Range and Key Size– Possible Types of Attacks.

UNIT IV: COMPUTER BASED SYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS
Algorithm Types and Modes – Overview of Symmetric Key Cryptography – Data Encryption Standard– Block Cipher Design Principles – International Data Encryption Algorithm – Advanced Encryption Standard.

UNIT V: COMPUTER BASED ASYMMETRIC KEY CRYPTOGRAPHY ALGORITHMS

Brief History of Asymmetric Key Cryptography – Overview of Asymmetric Key Cryptography – RSA Algorithm – Symmetric and Asymmetric Key Cryptography Together – Digital Signatures – Knapsack Algorithm.

3. TEXTBOOK

1) Atul Kahate, "Cryptography and Network Security",4thEdition, McGraw Hill Education (India) Private Ltd, 2019.

Unit– I	:	**Ch. 1.1 – 1.6**
Unit– II	:	**Ch. 9.1 – 9.5**
Unit– III	:	**Ch. 3.1 – 3.6, 3.8**
Unit– IV	:	**Ch. 4.1 – 4.3, 4.5 – 4.7**
Unit– V	:	**Ch. 2.1 – 2.2, 2.4 – 2.9**

4. REFERENCES

1) Behrouz A Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security" 3rd Edition, McGraw Hill Education (India) Private Ltd, 2015.
2) William Stallings, "Cryptography and Network Security" 7th Edition, Pearson India Education Services Pvt.Ltd. 2017.

5. WEB REFERENCES

- https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm
- https://www.w3schools.in/cyber-security/modern-encryption/
- https://www.mitel.com/articles/web-communication-cryptography-and-network-security
- https://www.ecpi.edu/blog/crypotgraphy-and-network-security

6. SUPPLEMENT LEARNING

- PKI and Security
- Secure Socket Layer
- Crypto Currency and Bitcoin
- Biometric Authentication
- Key Distribution Center

Semester – VI   **4 Hours/3 Credits**

ELECTIVE II: INTERNET OF THINGS

1. COURSE OBJECTIVES

- *To design and Develop IOT based solution for real world applications*
- *To realize the evolution of domain specific IoT.*

- *To understand the building blocks of Internet of Things and its characteristics.*
- *To understand the concepts of IOT and its application.*
- *To develop the IoT devices with help of Tools.*

2. COURSE OUTLINE

UNIT - I: INTRODUCTION TO INTERNET OF THINGS

Introduction – Definition and Characteristics of IoT – Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies – IoT Levels and Deployment Templates

UNIT - II: DOMAIN SPECIFIC INTERNET OF THINGS

Introduction – Home Automation – Cities – Environment – Energy – Retail – Logistics – Agricultural – Industries – Health and Lifestyle.

UNIT - III: DEVELOPING INTERNET OF THINGS

Introduction – IoT Design Methodology – Case Study on IoT System for Weather Monitoring - IoT Systems – Logical Design using Python - Python Data types and Data Structures – Control Flow – Functions – Modules – Packages – File Handling – Date/Time Operations – Classes – Python Packages of Interest for IoT.

UNIT - IV: IOT PHYSICAL DEVICES AND SERVERS

Introduction – Exemplary Device: Raspberry Pi – About the Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python – Other IoT Devices – Introduction to Cloud Storage Models and Communication API's – WAMP AutoBahn for IoT – Xively Cloud for IoT - Python Web Application Framework – Designing a RESTfull Web API – Amazon Web Services for IoT – SkyNet IoT Messaging Platform.

UNIT - V: DATA ANALYTICES AND TOOLS FOR IOT

Introduction – Apache Hadoop – Using Hadoop MapReduce for Batch Data Analysis - Apache Oozie – Apache Spark – Apache Storm – Using Apache Storm for Real-time Data Analysis – Tools for IoT – Introduction – Chef – Chef Case Studies – Puppet – Puppet Case Study Multi-tier Deployment – NETCONF-YANG Case Studies – IoT Code Generator

3. TEXTBOOK
1) Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A Hands-On Approach", Universities Press – 2015.
   Unit – I: Ch. 1
   Unit – II: Ch. 2
   Unit – III: Ch. 5, 6
   Unit – IV: Ch. 7, 8
   Unit – V: Ch. 10, 11

4. REFERENCES
1) Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

5. WEB REFERENCES
- https://www.coursera.org/courses?query=iot
- https://online.stanford.edu/courses/xee100-introduction-internet-things
- https://www.tutorialspoint.com/internet_of_things/index.htm

6. SUPPLEMENT LEARNING
- IoT Sensors
- Working with different types of sensors
- Different tools to make the IoT Projects

Semester – VI   **2 Hours/1 Credit**
NON MAJOR ELECTIVE- II: MULTIMEDIA

1. COURSE OBJECTIVES
- To understand the basic of Multimedia, Delivering Multimedia, Using Text and Fonts in Multimedia.
- To understand the basic of making still images, Understanding natural lights and color and various image file formats.
- To understand the basic of sounds, digital and MIDI audio, multimedia sound systems and sounds to your multimedia project.
- To understand the basic of animation, principles of animation and making animations.
- To understand the basic of working, displaying, shooting and editing of video.

2. COURSE OUTLINE

UNIT - I: INTRODUCTION TO MULTIMEDIA
Introduction to Multimedia, Where to use Multimedia, Delivering Multimedia, Text the Power of Meaning, About Font and Faces, Using Text in Multimedia, Computers and Text, Font Editing and Designing Tools.

UNIT – II: IMAGES
Making still images – Bitmap, Vector Drawing, 3-D Drawing and Rendering Color – Understanding Natural light and Color, Computerized Color, Color Palettes, Image File Format – Macintosh Format, Windows Formats, Cross – Platform Formats.

UNIT – III: SOUND
Sound: The power of Sound, Digital Audio, MIDI Audio, MIDI vs. Digital Audio, Multimedia System Sounds, Audio File Formats, Vaughan''s Law of Multimedia Minimums, Adding sound to Your Multimedia Project.

UNIT – IV: ANIMATION
Animation: The Power of Motion, Principles of Animation, Animation by Computer, Making Animations

UNIT – V: VIDEO

Video: Using Video, How Video Works and Is Displayed, Digital Video Containers, Obtaining Video Clips, Shooting and Editing Video.

3. TEXTBOOK
1) Tay Vaughan, "Multimedia: Making it work", 8th edition, Tata McGraw Hills.

Unit - I	**:**	**Ch. 1 - 2**
Unit - II	**:**	**Ch. 3**
Unit - III	**:**	**Ch. 4**
Unit – IV	**:**	**Ch. 5**
Unit – V	**:**	**Ch. 6**

4. REFERENCES
1) James E Shuman, "Multimedia in action", Vikas Publishing House.
2) Andreas hoi zinger, "Multimedia basics volume / technology", firewall media New Delhi.

5. WEB REFERENCES
   Online Tutorial
   - https://multimedia.journalism.berkeley.edu/tutorials/starttofinish/
   - http://www.w3schools.com/html/html_media.asp

   Online Quiz
   - http://highered.mheducation.com/sites/0072367555/student_view0/chapter13/multiple_choice_quiz.html
   - http://treeknox.com/computer/languages/computer-multimedia-questions/index.php

   6. SUPPLEMENT LEARNING
   - Basic Multimedia Software Tools
   - Making Instant Multimedia
   - Multimedia Authoring Tools
   - Font Editing and Designing Tools
   - Multimedia and the Internet

Semester – VI   **4 Hours/4 Credits**

PRACTICAL IX - MOBILE APPLICATION DEVELOPMENT AND PHP

1) Simple Android Application.
2) Working with Activities and Intents
3) Working with Fragments
4) UI Controls (Text, Edit Text, Button, Radio Button)
5) UI Controls (Check Box, and Layout, Image Button, Toggle Button)
6) UI Controls (Rating Bar, List View, Gallery)
7) CRUD Operations Using SQLite DB

8) Emailing
9) Telephony
10) SMS

PHP

11) Control Structures and Arrays
12) Use of Date and time Functions and Mathematical Functions
13) Use of GET and POST Method
14) Form Validation Techniques
15) File operations Read, Write, upload
16) Creation of session and cookies
17) Creation of tables, Insertion, Updation and Deletion of rows in MYSQL tables
18) Database connectivity in PHP with MySQL
19) Creation of Simple web pages – I
20) Creation of Simple web pages – II

Semester – VI   **6 Hours/4 Credits**

PROJECT WORK

OBJECTIVE

- To practice the Software Development Life Cycle (SDLC) in an application or system domain.

i. General Regulations

1) The project work report must be original. Photocopies are not accepted.

2) In the course of project development each student must have regular consultation with guides and these consultations must be recorded. The consultation is meant to review the candidate progress, besides the advising the candidate on any project issues. During each consultation the candidate must submit, the intermediate deliverables to the project guide for review. The deliverable will be assessed and marks will be allocated during the final project presentation.

3) Each consultation report must reflect the detailed tasks completed for the period, the problems encountered in the course of the project, how the candidate resolved them and the plan for the next phase.

4) A minimum of five consultations throughout the project is essential to accept the project for the final evaluation.

5) Two copies of the project are to be submitted at the prescribed time announced by the department.

6) A student shall be declared to be successful in the project if s/he secures 40% or above in the semester examination and 40% or above in the aggregate of CA and the semester examination. If the candidate fails, he/she has to improve his/her project and s/he has to resubmit in the following.

7) Viva-voce is compulsory for all candidates who have submitted the project work. If

a candidate is absent for viva voce, and then his absence is treated as absence for the semester examinations.

8) The students who fail in the project work will have to redo the whole project again.

9) Combined projects are not allowed.

ii.   Evaluation

CA (Continuous Assessment)			50 Marks

	First Review
	    First Review should cover the following artifacts
	    1. Requirement analysis
	    2. Design
		25 Marks	

	Second Review
	    Second Review should cover the following artifacts
	    1. Implementation
	    2. Testing
		25 Marks	

	Total	**50 Marks**	
Semester			**50 Marks**
	Evaluation of Project Work	20 Marks	
	Demo	10 Marks	
	Presentation	10 Marks	
	Viva Voce	10 Marks	
	Total	**50 Marks**	**100 Marks**

Two examiners will evaluate the project report separately and average is calculated for the final semester mark.