SACRED HEART COLLEGE (AUTONOMOUS)

Tirupattur – 635 601, Tamil Nadu, S.India

Ready for Every Good Work

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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

BCA

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

CRITERION I

CRITERION I   *NAAC 5th CYCLE*

Sem	Subject Code	Part	Subject	L	P	CD	CA	SEM
	LE215BP		English Lab – II			1	-	100
				28	2	23		

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
	CA315A/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#**		

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
	PCA608J	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***		

B.Com (CA) Allied course

SEMESTER	PART	SUBJECT	L	P	CD
I	III	Office Automation	4		3
	III	Practical -I : Office Automation		2	1
II	III	Internet Concepts and Web Design	4		3
	III	Practical -II : Internet Concepts and Web Design		2	1
III	III	Programming with C	4		3
	III	Practical -III: Programming with C		2	1
IV	III	Relational Database Management System	4		3
	III	Practical -IV: Relational Database Management System		2	1
V	III	Computer Organization	4		4
	III	Web Programming Using PHP	4		4
	III	Practical -V: Web Programming Using PHP		2	2
VI	III	Management Information System	4		4
		TOTAL	**28**	**10**	**30**

SEMESTER I   **4-0-4-50-50**

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==**CA107 : DIGITAL COMPUTER FUNDAMENTALS**==

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1. **COURSE OBJECTIVES**

Digital Computer Fundamentals describes the evolution and organization of a computer system. The Computer Fundamentals also explain the internal representation of data and how it has been processed using the gates and circuits. The objective of this course is to know and understand the fundamentals of computer system, basics of digital design, number system, combinational circuits, sequential circuits, register and counters.

2. **PREREQUISITES**

Awareness on applications of computers and basic Mathematical knowledge.

3. **COURSE OUTCOMES**
   At the end of the course, the students will be able to:

Co No.	CO Statement	K-Levels
CO1	Explain the Characteristics, Generations of a Computer, Purpose and Types of Input & Output Unit, Processing Unit, Memory Unit and Storage devices	
CO2	Understand different Number Systems, Complements available to represent data and IC Logic gates, Boolean algebra for the simplification of expressions for Computer processing.	
CO3	Apply the Boolean Algebra rules and K-maps for simplification of expressions and explain the purpose and working of Combinational Circuits	K1 – K6
CO4	Understand and analyze the Sequential logic circuits - flip flops	
CO5	Draw the circuit diagram and explain the purpose and types of registers, counters.	
CO6	Understand and analyze the different types of memory units	

4. COURSE OUTLINE

UNIT I: 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 II: 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 III: 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 IV: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 V: DIGITAL COMPONENTS

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

5. TEXT BOOK

i)   Pradeep K. Sinha, PritiSinha, "Computer Fundamentals", Sixth Edition.BPB Publications.
        UNIT I   : Ch.1, 2, 7 & 8

i)   M.Morris Mano, "Digital Logic and Computer Design", 3rd edition, Pearson Education, Delhi, 14th Impression 2012.
        UNIT II   : Ch.1 & 2

        UNIT III   : Ch. 3, 4 & 5

        UNIT IV   : Ch. 6

        UNIT V   : Ch. 7

6. REFERENCES

i)   Anita Goel, "Computer Fundamentals", Pearson India, 2010
ii) Donald P Leech, Albert Paul Malvino and GoutamSaha, "Digital Principles and Applications", Tata McGraw Hill, 2007.
iii) Bartee, "Digital Computer Fundamentals", Tata McGraw Hill Publications.
iv) Malvino, "Digital Computer Electronics", Tata McGraw Hill Publications

7. WEB REFERENCES

i)   https://www.tutorialspoint.com/digital_circuits/index.htm
ii)   https://www.javatpoint.com/digital-electronics
iii) https://www.electronics-tutorials.ws/logic/logic_1.html

8. SUPPLEMENT LEARNING

* Four, Five, Six K-Maps
* RAID storage devices
* Computer Languages
* Data Representation
* Computer Arithmetic

CA108: INTERNET CONCEPTS AND WEB DESIGN

1.   COURSE OVERVIEW

This course enables standard website design using HTML, CSS and JavaScript. The main aim of this course is to introduce planning and designing effective web pages. The learner will know to validate web pages using JavaScript. The different elements of the course explore the various page layout techniques, text formatting, graphics, images and producing a functional multi-page website.

2. PREREQUISITES

Basic understanding of web pages and designs.

3. COURSE OUTCOMES

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

CO Nos.	CO Description	K – Levels
CO1	Learn about the basic structure and use of an HTML element (content, attributes, etc.) K1	K1 - K6
CO2	Understand the basics of data communication, networking, internet and their importance, and recognize the different internet devices and their functions K2	
CO3	Apply the knowledge of HTML tags to design web pages. K3	
CO4	Analyze the performance and functionalities of HTML tags, CSS and JavaScript k4	
CO5	Evaluate the web contents using JavaScript k5	
CO6	Develop web programs with effective design and perform client side validations. K6	

4. 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.

5. **TEXT BOOKS**
    1) Dr.Raymond Nancy Philip, "A Text Book 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

6. **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.

7. **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

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

CA207 : PROGRAMMING WITH C

1. COURSE OVERVIEW

This course imparts adequate knowledge on the need of programming languages. It develops an in-depth understanding of functional and logical concepts of C Programming. It familiarizes the basic syntax and semantics of C Language. The course focuses on Input/output operations on files.

2. PREREQUISITES

Basic knowledge of mathematical and algorithmic logics, to understand major control structures such as branching, loops and expressions.

3. COURSE OUTCOMES
At the end of the course, the students will be able to

CO Nos.	COs Description	K – Levels
CO1	Relate the basic terminology of algorithm and flowchart used in programming.	
CO2	Explain the concepts of structure and union	
CO3	Acquire knowledge on decision making and looping concepts	
CO4	Distinguish the processing of sequential and random-access file.	K1 - K6
CO5	Develop programs with various concepts like decision structures, loops and functions.	
CO6	Validate the use of arrays and pointers in data structures	

4. COURSE CONTENT
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,oneandtwodimensionalarrays)-CharacterArraysandStrings.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 – PointerExpressions–PointersandArrays–PointersandCharacterStrings–ArrayofPointers

– 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.

5. **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

6. **REFERENCES**
   1) YashavantKanetkar, "Let us C", BPB Publications, Tenth Edition - New Delhi:2010
   2) Ashok N. Kamthane, "Programming in C", Second Impression, Pearson:2012.
7. **WEB REFERENCES**
   a. http://www.c4learn.com/?gclid=COK1y6nHk7wCFcUA4godmlgAKA/
   b. http://www.cprogramming.com/tutorial/c-tutorial.html/
   c. http://www.tutorialspoint.com/cprogramming/
8. **SUPPLEMENTLEARNING**
   a. Command Line Arguments
   b. Recursive Algorithm

OPERATING SYSTEM

1. COURSE OVERVIEW

The objective of this course is to provide an overview of operating system along with its functions and structure. The course also emphasizes on the process management, processor scheduling; deadlock, main-memory management, virtual memory management, file-system structure and implementation.

2. PREREQUISITES

Basics on Computer Hardware and Computer Organization and Architecture

3. COURSE OUTCOMES

At the end of the course, the students will be able to

CO Nos.	COs Description	K – Levels
CO1	Describe the important computer system resources and the role of operating system in the coordination and control of computer resources.	
CO2	Understand the process management techniques and scheduling algorithms	
CO3	Evaluate the requirement for deadlock process synchronization and deadlock handling methods.	K1 - K6
CO4	Explain and analyze the memory management and its allocation policies.	
CO5	Apply the file management policies with respect to different storage management technologies	
CO6	Understanding the integration of various File system structure	

4. 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 IIIPROCESS 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.

5. **TEXT BOOK**
   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

6. **REFERENCES**
   1) DeitelHarvay M., "Operating Systems", 2003, Pearson Education Publications, Singapore.
   2) GodboleAchyut 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.

7. **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

8. SUPPLEMENT LEARNING

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

CA312: COMPUTER NETWORKS

1. COURSE OBJECTIVES

The main emphasis of this course is on the organization and management of local area networks (LANs). Obtaining a theoretical understanding of data communication and computer networks gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems. Topics include layered network architectures, addressing, naming and protocols.

2. PREREQUISITES

Basics concepts of communication, digital electronics and computers.

3. COURSE OUTCOMES

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

COs Nos	CO Statement	K – Levels (Cognitive Levels)
CO1	Understand the general principles of data communication.	
CO2	Assess error detection and correction techniques.	
CO3	Experiment the performance of network layer and IPv4 and IPv6 addresses.	
CO4	Analyze various transport layer protocols like Stop-and-Wait, Go-Back-N and selective repeat protocols.	K1 – K6
CO5	Develop the concept of client /server programming, DNS, FTP, Electronic mail and SNMP.	
CO6	Memorize the services and features of TCP and UDP	

4. COURSEOUTLINE

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: DATALINKLAYER

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. IPV6 addressing–Packet Format – Mobile IP.

UNIT–IV:TRANSPORT LAYER

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

Connection – SCTP.

UNIT–V:APPLICATIONLAYER

Introduction–ClientServerProgramming–WWWandHTTP–<mark>FTP–ElectronicMail</mark> –Telnet– DNS – <mark>SNMP: Managers and Agents</mark> – Management Components.

6. TEXT BOOK

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**
Unit– V	**:**	**Ch. 25.1 – 25.2, 26.1 – 26.4, 26.6, 27.2**

7. 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

8. WEBREFERENCES

- 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/

9. SUPPLEMENTLEARNING

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

CA313: PROGRAMMING WITH JAVA

1. **COURSE OBJECTIVES**

   Java is known for reliability, maintainability and ease of development. Its unique architecture enables programmers to develop a single application that can seamlessly run across multiple platforms.The course introduces object-oriented programming principles. Emphasis is placed on event-driven programming methods, including creating and manipulating objects, classes, and using object-oriented tools such as the class debugger. To build confidence among the learners to construct robust applications that use Java's object-oriented features.

2. **PREREQUISITES**

   Fundamental knowledge on algorithms and programming.

3. **COURSE OUTCOMES**

   At the end of the course, the students will be able to

CO Nos	CO Statement	K – Levels (Cognitive Levels)
CO1	Remember the basic concepts of object oriented programming and important features of Java language.	
CO2	Solve the inter-disciplinary applications using the concept of inheritance.	
CO3	Explain different techniques on creating and accessing packages and exception handling to avoid abnormal termination of program and multithreading concepts to develop inter process communication.	K1 – K6
CO4	Design simple GUI interfaces to interact with users, using Applets.	
CO5	Recognize the process of graphical user interface design and implementation using swing.	
CO6	Describe Swing component classes	

4. **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.

5. TEXT BOOK
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

6. 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.

7. WEB REFERENCES

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- 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

8. 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

This course covers the linear and non-linear data structures. It enables the learners to solve problems through the data structures. This course includes all the necessary content on various data structures like Arrays, Stacks, Linked lists, Queues, Trees and Graphs and how to implement them using C Programming.

2. PREREQUISITES

Basics concepts of C Programming

3. COURSE OUTCOMES

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

CO Nos.	CO Statement	K – Levels
CO1	Understand the concepts of linear and non-linear data structures	
CO2	Implement the arrays and linked list to build the sequential data structure	
CO3	Apply the various operations of stack and queue in real time problem	K1 – K6
CO4	Analyze and evaluate the sorting and searching algorithms	
CO5	Familiarize the graph algorithms	
CO6	Apply problem solving techniques for real time problems through data structures	

4. 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.

5. **TEXT BOOK**
   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

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

7. **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

8. SUPPLEMENT LEARNING

- Time and Space Complexity of the Algorithm
- Eight Queens Problem
- AVL Trees
- Advanced Sorting concepts
- Abstract Data Type

CA315A: ELECTIVE –I: ANGULAR JS

1. COURSE OVERVIEW

The objective of this course is to create web applications that depend on the Model-View-Controller Architecture, and decline the reliance on JavaScript required to functionalize web applications.AngularJS is a structural framework for creating dynamic web applications. HTML is a great declarative language for static pages. It does not contain much for creating a dynamic applications. So Angular JS filling that gap. Angular's data binding and dependency injection eliminate much of the code than we would actually write. The best part is that it all happens in the browser by making it an ideal partner with any server technology.

2. PREREQUISITES

Working knowledge of HTML and JavaScript

3. COURSE OUTCOMES

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

CO Nos.	CO Statement	K – Levels
CO1	Understand how Angular JS differs from other frameworks	
CO2	Set up a test environment for AngularJS	
CO3	Shows why Angular JS is a better framework for building modern web applications and websites	
CO4	Working on a functional application and implement testing	K1 – K6
CO5	Covers search engine optimization as it relates to Angular JS applications and websites.	
CO6	Retrieve data from back-end server, manipulate it and display it with ease.	

4. 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

5. **TEXT BOOK**
   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

6. **REFERENCES**
   - AsimHussain, "Angular: From to Practice". CodeCraft, 1ˢᵗ Edition, 2017

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

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

CA315B ELECTIVE –I :OBJECT ORIENTED ANALYSIS AND DESIGN

1. **COURSE OVERVIEW**

   Object-oriented analysis and design is a technical approach for analyzing and designing an application, system, or business by applying object-oriented programming, as well as using visual modeling throughout the software development process to guide stakeholder communication and product quality.

2. **PREREQUISITES**

   Basic understanding of computer programming, OOPs and programming paradigms.

3. **COURSE OUTCOMES**

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

CO Nos.	CO Statement	K – Levels
CO1	Understand the modeling concept and object Oriented designs, recognize the notations of UML	K1 – K6
CO2	Create UML diagrams with proper notations and uses	
CO3	Apply their skill on framing new design based on the requirements	
CO4	Analyze the system requirements with UML diagrams and design the systems	
CO5	Implement modules, process flows of the systems	
CO6	Evaluate the requirements, designs, and process flow of the systems	

4. **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 GlobalResources

– <mark>Class Design.</mark>

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.– StarUML (OpenSource)

5. TEXT BOOK

i) 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**

6. REFERENCES

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

7. WEBREFERENCES
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/

8. SUPPLEMENT LEARNING
- Domain Analysis
- ApplicationAnalysis
- Databases
- IterativeDevelopment
- Legacy Systems

CA315C: ELECTIVE - I: SYSTEM ANALYSIS AND DESIGN

1. COURSE OVERVIEW

Systems Analysis and Design is an active field in which analysts repetitively learn new approaches and different techniques for building the system more effectively and efficiently. The primary objective of systems analysis and design is to improve organizational systems. This course provides a basic understanding of system characteristics, system design, and its development processes.

2. PREREQUISITES

Problems solving skills and basics on software designs.

3. COURSE OUTCOMES

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

CO Nos.	CO Statement	K – Levels (Cognitive Levels)
CO1	Understand the design and development of systems	K1 – K6
CO2	Apply and analyze the design based on requirements to develop systems	
CO3	Create system designs based on inputs and outputs	
CO4	Describe the memory storage devices	
CO5	Evaluate the quality of the system	
CO6	Acquire knowledge on software development	

4. 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.

5. **TEXT BOOK**
   i) 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**

6. **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.

7. **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

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

SOFTWARE ENGINEERING

1. COURSE OVERVIEW

This course makes student learn the essential of software Engineering. The objective of this course is to know and understand the fundamentals of software process and requirements modeling, and to gain knowledge of architectural design. It gives an in depth knowledge of risk management and re engineering.

2. PREREQUISITES

Basic programming skills, Database, Designing Knowledge

3. COURSE OUTCOMES

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

CO Nos.	CO Statement	K – Levels
CO1	Identify the need for engineering approach to software development and various processes k1	
CO2	Understand about software myths, generic view of the process and process models k2	
CO3	Analyze various software engineering models and apply methods for design and development Process. K4	K1 – K6
CO4	Acquire knowledge on the wider perspective of software engineering architecture design	
CO5	Assess the concept of Component Based software Engineering	
CO6	Enhance in the techniques of risk management and re-engineering	

4. 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. TEXT BOOK

1) Roger S.Pressman, "Software Engineering A Practitioners Approach", McGraw 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

ENTERPRISE APPLICATIONS USING .NET

1. COURSE OVERVIEW

This course covers the practical aspects of multi-tier application development using the .NET framework. The goal of this course is to introduce the basics of distributed application development. And lead the Web Service development and .NET remoting. Technologies covered the Common Language Runtime (CLR), .NET framework classes, C#, ASP.NET, and ADO.NET. And also covers service oriented architecture, design, performance, security, content managements systems and deployment issues encountered in building multi-tier distributed applications.

2. PREREQUISITES

Basic Programming skills, OOPs concepts, UI controls

3. COURSE OUTCOMES

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

CO Nos.	CO Statement	K – Levels
CO1	Know the differences between desktop and web application.	
CO2	Understand the development and deployment cycles of enterprise applications	
CO3	Create and configure the GUI components in C#.	K1 – K6
CO4	Create ASP.NETapplications using standard .NET controls.	
CO5	Analysis and evaluate the validation and rich controls	
CO6	Create and connect the data sources in ADO.NET	

4. 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 Metacharacters – 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.

5. TEXT BOOKS
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

6. REFERENCES
1) Rebecca M.Riordon, "Microsoft ADO .Net 2.0 Step by Step", Prentice Hall of India Private Limited, New Delhi, 2007.
2) VikasGupta , "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.

7. **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

8. **SUPPLEMENT LEARNING**
   - ASP.NET Administrative Tasks
   - AJAX extensions
   - Working with XML data
   - WCF
   - SQL Basics

RELATIONAL DATABASE MANAGEMENT SYSTEMS

1. COURSE OVERVIEW

The RDBMS is the most popular database system which facilitates functions to maintain the security, accuracy, integrity and consistency of the data. . RDBMS provides methods for storing and retrieving large amounts of data and uses Structured Query Language (SQL) to access the database. The objective of the course is to present an introduction to database management systems and how to organize, maintain and retrieve information efficiently and effectively from a DBMS.

2. PREREQUISITES

Basic knowledge about the data organization and data storage.

3. COURSE OUTCOMES

At the end of the course, the students will be able to

CO Nos.	CO Statement	K – Levels
CO1	Discuss database concepts, applications, data models	
CO2	Identify the tables and relationships between tables.	
CO3	Apply normalization concepts to design the database.	
CO4	Implement data definition, constraints, schema to organize data in database	K1 – K6
CO5	Integrate the concepts of queries, joins, aggregate functions in SQL.	
CO5	Develop the strong ability to use the database concepts for create queries and operations.	

4. COURSE CONTENT

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 – <mark>Entity Relationship design issues</mark> – 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.

5. **TEXT BOOKS**
   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

6. **REFERENCES**
   1) Peter Rob, Carlos Coronel, "Database Systems – "Design, Implementation and Management"c, GalgotiaPublicaitons.
   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) RajeshkharSunderraman, "Oracle 8 Programming A Primer", Addition Wesley Publication, New Delhi, 2000.

7. **WEB REFERENCES**
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   - 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/

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

CA415: EMERGING COMPUTING PARADIGMS

1. COURSE OBJECTIVES

Emerging Computing Paradigms offers the recent technologies emerging in the information technology field. Emerging computing paradigms is to provide a base and impart the knowledge of recent techniques, technologies and tools. The objective of this course is to explain the features and benefits of E-Commerce, Block Chain, Content Management System, Machine Learning Algorithms, Artificial Intelligence System and Quantum Computing.

2. PREREQUISITES

Basic knowledge in computer and mathematics.

3. COURSE OUTCOMES

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

CONo.s	CO Statement	K-Levels
CO1	Explain the benefits of E-Commerce and the features available in e-business.	
CO2	Understand the basics of Block Chain and its applications.	
CO3	Study and apply content management system and various CMS models exist.	
CO4	Understand, analyze and evaluate machine learning and its different categories of algorithms.	K1 – K6
CO5	Explain and implement the basics and uses of Artificial Intelligence System.	
CO6	Understand and analyze the basics of Quantum Computing	

4. 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.

5. **TEXT BOOKS**
    i) Bharat Bhaskar, Electronic Commerce; Framework, Technology and Application, 4th Edition, McGraw Hill Education, 2006.
    ii) Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press (July 19, 2016).
    iii) Deane Barker, Web Content Management: System, Features and Best Practices, 1st Edition, O'Reilly Publication,
    iv) EthemAlpaydin, "Introduction to Machine Learning", The MIT Press, September 2014, ISBN 978- 0-262-02818-9.
    v) Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Publication, 2nd Edition, 2002.
    vi) P Kaye, R Laflamme and M Mosca, "An Introduction to Quantum Computing",Oxford University Press, 2007.

6. **REFERENCE BOOKS**
    - Martin Kutz, Introduction to E-Commerce, bookboon.com, 1st Edition, 2016.
    - MehryarMohri, AfshinRostamizadeh, AmeetTalwalkar, "Foundations of Machine Learning", MIT Press (MA) 2012.
    - Jeff Heaton, Artificial Intelligence for Humans-Fundamental Algorithms, Create space Independent Pub; 1st edition, 2013.
    - Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann 1998.

7. **WEB REFERENCES**
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    - 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/

8. SUPPLEMENT LEARNING

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

CA514: SOFTWARE TESTING AND QUALITY ASSURANCE

1. COURSE OVERVIEW

It emphasis on Software Quality Assurance (SQA) architecture and SQA components. It provides the knowledge of SQA components that can be integrated into the project life cycle. It familiarize with the software quality infrastructure. Exposure to the management components of software quality will be focused.

2. PREREQUISITES

Software Engineering, Database/SQL, basic knowledge in Linux commands

3. COURSE OUTCOMES

At the end of the course, the students will be able to

CO Nos.	CO Statement	K – Levels
CO1	Adapt the fundamentals of software testing and quality assurance concepts	K1 – K6
CO2	Demonstrate the testing activities through modern software tools	
CO3	Construct test cases for software requirement specifications.	
CO4	List the different levels of Testing and its functions.	
CO5	Examine the ways of judging test case adequacy and how to manage tests.	
CO6	Consolidate the process of verification and validation.	

4. COURSE CONTENT

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.

5. TEXT BOOKS

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

6. 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.

7. 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

8. SUPPLEMENT LEARNING

- Quality Management Plan
- Test Strategy
- Test Plan
- Test Cases
- Test driven development

CA515: COMPUTER GRAPHICS

1. COURSE OVERVIEW

The main objective of the course is to introduce fundamental concepts and theory of computer graphics. It represents the important drawing algorithm, polygon filling, clipping and 2D transformation curves and an introduction to 3D transformation. It provides the basics of OpenGL application programming interface.

2. PREREQUISITES

Basic Knowledge of C, Java and data structures & algorithm

3. COURSE OUTCOMES

At the end of the course, the students will be able to

CO Nos.	CO Statement	K – Levels
CO1	Enumerate the mechanisms involved in basic transformation of an object in Two dimensions.	
CO2	Identify the basic function of displays and algorithm mechanism for generating line and circle.	
CO3	Apply the transformation effects to the objects in Three dimensions.	K1 – K6
CO4	Analyze the procedure in manipulating an object from window to viewport.	
CO5	Predict the possible surface for the visibility of the objects	
CO6	Determine projected objects to naturalize the scene in 2D view.	

4. COURSE CONTENT

UNIT-I: OVERVIEW OF GRAPHICS SYSTEM

Raster 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 – <mark>Input of Graphical Data</mark> – 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.

5. **TEXT BOOK**

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.

6. **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.

7. **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

8. **SUPPLEMENT LEARNING**
- Real Time Graphics • Texture Bump Mapping
- Photo Realistic Graphics
- Image Based Rendering
- Visual Realism

CA516: ENTERPRISE APPLICATIONS USING JAVA

1. COURSE OBJECTIVES

This course provides a platform with enterprise features such as distributed computing and web services. Java EE has several specifications which are useful in making web pages, reading and writing from database in a transactional way, managing distributed queues. The Java EE contains several APIs which have the functionalities of base Java SE APIs such as Enterprise JavaBeans, connectors, Servlets, Java Server Pages and several web service technologies.

2. PREREQUISITES

Computer programming languages and HTML elements.

3. COURSE OUTCOMES

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

CO Nos.	COs Statement	K – Levels
CO1	Learn and Understand the structure of web applications and enterprise programs	
CO2	Develop web applications using servlets	
CO3	Apply the knowledge on servlet to create enterprise programs	K1 – K6
CO4	Analyze the concept of Servlets and JSP Create JSP programs with the programming knowledge	
CO5	Apply database knowledge to implement CRUD applications	
CO6	Evaluates the program	

4. 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

5. **TEXT BOOKS**

> i) Jim Keogh, "The Complete Reference: J2EE", McGrawHill Education, 2015

>> Unit – I : Ch. 1, 2

>> Unit – IV: Ch 11

> ii) 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.

> iii)C.Muthu, "Programming in JAVA", Thomson Learning, 2004.

>> Unit – I : Ch. 20

>> Unit – III: 19

> iv) LamePekowsky, "Java Server Pages", Pearson Education, 2004.

>> Unit – V: Ch 3, 6

6. **REFERENCES**
    - James McGovern etl., "Java Web Services Architecture", Elsiver, 2005.
7. **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

8. SUPPLEMENT LEARNING

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

CA517: PROGRAMMING WITH PYTHON

1. COURSE OVERVIEW

Python is a high-level interpreted language that has many benefits, including easy-to-read and easy-to-write syntax and powerful libraries that provide additional functionality. It is used extensively for practical applications in engineering and data science. This course covers a range of topics, such as data types, control flow, functions, file operations, and object-oriented programming and GUI applications.

2. PREREQUISITES

Basic Programming skills and OOPs concepts.

3. COURSE OUTCOMES

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

CO Nos.	CO Statement	K – Levels
CO1	Learn core Python scripting elements	
CO2	Understand the OOP concepts and file operations	
CO3	Demonstrate the use of Python libraries, packages and modules	
CO4	Apply the library files for graphical representation and visualization	K1 – K6
CO5	Create the GUI applications	
CO6	Construct scripts to scrap the web to obtain web content.	

4. 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

<mark>Scrape and Parse Text from Websites</mark> - 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 <mark>- Challenge: PDF Page Extraction</mark> - Introduction to Tkinter - Working With Widgets -Controlling Layout With Geometry Managers - Making Your Applications Interactive - Example App: Temperature Converter - Example App: Text Editor

5. **TEXT BOOKS**
   1) Jeeva Jose and P. SojanLal, "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

6. **REFERENCES**
   1) ChSatyanarayana, M Radhika Mani & B N Jagadesh, "Python Programming", Universities Press, 2018.
7. **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

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

CA612: CLOUD COMPUTING

1. COURSE OVERVIEW

This course introduces domain of cloud infrastructures, virtualization, software defined networks, cloud storage, and programming models. Modern data centers enable many of the economic and technological benefits of the cloud paradigm. Focus on virtualization as a key cloud technique for offering software, computation and storage services.

2. PREREQUISITES

Basics of database, knowledge of operating systems, security and privacy.

3. COURSE OUTCOMES

At the end of the course, the students will be able to

CO Nos.	CO Statement	K – Levels (Cognitive Levels)
CO1	Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies	
CO2	Implement different types of Virtualization technologies and Service Oriented Architecture systems	
CO3	Identify the concepts of cloud reference model, economics of the cloud and open challenges	K1 – K6
CO4	Analyse Aneka cloud application platform and thread programming	
CO5	Choose among various cloud technologies for implementing applications	
CO6	Install and use current cloud technologies	

4. COURSEOUTLINE

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 – Technologyexamples.

UNIT – III : CLOUD COMPUTING ARCHITECTURE

Introduction – Cloud Reference Model- Types of Clouds – Economics of Cloud –Open Challenges.

UNIT – IV: ANEK

A-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 – <mark>Business and Consumer Applications.</mark>

5. **TEXT BOOK**
   1) RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, "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**

6. **REFERENCES**
   1) RajkumarBuyya, James Broberg, AndrzejGoschinski, "Cloud Computing- Principles and Paradigms", John Wiley and Sons, Inc, NewJersey.
   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

7. **WEBREFERENCES**
   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

8. **SUPPLEMENTLEARNING**
   - Data Security in Cloud Computing
   - Big Data Analytics
   - Multitenant Technology
   - Virtualization Technology
   - Service Technology

CA613 : MOBILE APPLICATION DEVELOPMENT

1. COURSE OBJECTIVES

This course explains and demonstrates the architecture, platform, tools, libraries and components needed to develop a mobile app. The objective of the course is to understand and design mobile apps using activities, layouts, widgets and fragments. It also provides libraries, methods and tools to develop professional apps to send SMS, Notifications, Mails, Telephony and data manipulation using SQLite.

2. PEREQUISITES

Basic knowledge in web design, mobile apps, database and scripting language.

3. COURSE OUTCOMES

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

Co Nos.	CO Statement	K-Levels
CO1	Explain about the mobile app development architecture, framework, packages, Android basic syntax, libraries and Virtual devices available to develop mobile apps.	
CO2	Understand and implement Activities, Indents and Frameworks	
CO3	Understand and apply layouts, widgets and view groups to design mobile apps.	K1 – K6
CO4	Analyze and design mobile apps with images, menus in different layouts	
CO5	Create Notifications and database operations with SQLite.	
CO6	Analyze and build mobile apps for sending SMS, Emails, telephony and Google play store registration	

4. 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.

5. **TEXT BOOK**
   i) 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

6. **REFERENCES**
   - Reto Meier ,"Professional Android Application Development",2009 Edition, Willy
   - Publication.

- ZigurdMednieks, Laird Dornin, G. Blake Meike,and Masumi Nakamura, "Programming Android", OReilly publications.
- Sayed Y. Hashimi, SatyaKomatineni, Dave MacLean, "Pro Android 2", 2010 Edition, Wiley publications.

7. WEB REFERENCES

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- 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*

8. SUPPLEMENT LEARNING

- Building Mobile Applications using Xamarin
- Making the App as a commercial in play store

CA614: WEB PROGRAMMING USING PHP

1. COURSE OVERVIEW

The objective of this course is to delivers the fundamentals of PHP. Its helps to build dynamic web applications. It deals with MySQL queries and database connections to interact with frontend applications.

2. PREREQUISITES

Basic knowledge in HTML, CSS and JavaScript

3. COURSE OUTCOMES

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

CO Nos.	CO Statement	K – Levels
CO1	Understand the basic fundamental syntax and functions.	
CO2	Understand and evaluate form processing and validation methods	
CO3	Know the file handling concepts.	K1 – K6
CO4	Understand and apply MySQL functions.	
CO5	Apply and solve various database operations	
CO6	Connect frontend and backend applications using PHP	

4. 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 ConstantsPHP 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.

5. **TEXT BOOK**
   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**

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

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   - 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.

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

CA615A: ELECTIVE – II :BIG DATA ANALYTICS

1. COURSE OVERVIEW

This course describes the 5 V's of data and offers NoSQL databases for data management, R Programming for data analysis. The objective of this course is to identify study and understand the types of digital data, new big data database tools and languages to process the big data. It also demonstrates the tools and methods to store big data with different data structures, perform statistical analysis and visualize the results.

2. PREREQUISITES

Basic knowledge about Database and Programming Language.

3. COURSE OUTCOMES

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

Co No.s	Statement of CO	K-Levels
CO1	Describe the types of digital data, characteristics of big data, challenges in big data, data analytics and its tools.	
CO2	Understand and compare the NoSQL databases and its features	
CO3	Study and build simple applications using basics of R language and its packages.	K1 – K6
CO4	Understand and develop methods to read and process external data using R syntax	
CO5	Understand, apply and evaluate the visualization methods available in R	
CO6	Evaluate, and implement statistical algorithms for the online free data set	

4. 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

NoSQLDatabases : 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

5. **TEXT BOX**
   i)   SeemaAcharya and SubhashiniChellappan, "Big Data And Analytics", Wiley Publications, 2015.

          UNIT I - Ch. 1, 2 & 3

   ii)   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

   iii)   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

6. **REFERENCES:**

i)   EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing,Visualizing and Presenting Data", Wiley publishers, 2015.

ii)   Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and itsApplications", Wiley Publishers, 2015.

iii)   Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.

iv)   Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley &Sons, Inc., 2012.

v)   Jared P Lander, R for everyone: advanced analytics and graphics, Pearson Education, 2013.

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

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

CA615B: ELECTIVE II: - CRYPTOGRAPHY AND NETWORK SECURITY

1. COURSE OBJECTIVES

This course develops a basic understanding of the algorithms used to protect data. A wide variety of basic cryptographic primitives will be discussed along with recent developments. The cryptanalysis part understands, challenges for cyber security that includes network security, data security, mobile security, cloud security and endpoint security.

2. PREREQUISITES

Data structures and algorithms,Data communication and networks.

3. COURSE OUTCOMES

At the end of the course, the students will be able to

CO Nos.	Cos	K – Levels (Cognitive Levels)
CO1	Recollect basic principles of security services and mechanisms.	
CO2	Describe the concepts of network security like firewalls, IP security and virtual private network	
CO3	Categorize various cryptographic techniques that are used to prevent attacks.	
CO4	Analyze and design classical encryption techniques and block ciphers	K1 – K6
CO5	Implement system level security applications	
CO6	Create an algorithms using both symmetric and asymmetric key cryptography	

4. COURSE OUTLINE

UNITI: 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.

UNITII: 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.

UNITIV: 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.

UNITV: 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.

5. TEXT BOOK
1) AtulKahate, "Cryptography and Network Security",4th Edition,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**

6. REFERENCES
1) Behrouz A Forouzan and DebdeepMukhopadhyay, "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.

7. 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

8. SUPPLEMENT LEARNING
* PKI and Security
* Secure Socket Layer
* Crypto Currency and Bitcoin
* Biometric Authentication
* Key Distribution Center

CA615C: ELECTIVE II: INTERNET OF THINGS

1. COURSE OVERVIEW

This course gives a foundation in the Internet of Things, including the components, tools, and analysis by teaching the concepts behind the IoT and a look at real-world solutions. This Course focuses on hands-on IoT concepts such as sensing, actuation and communication. It covers the development of Internet of Things (IoT) prototypes including devices for sensing, actuation, processing, and communication.

2. PREREQUISITES

Knowledge on sensors and electrical equipment's

3. COURSE OUTCOMES

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

CO Nos.	CO Statement	K – Levels
CO1	Remember the IOT based solution for real world applications	
CO2	Realize the evolution of domain specific IoT.	
CO3	Understand the building blocks of Internet of Things and its characteristics.	
CO4	Understand the concepts of IOT and its application.	K1- K6
CO5	Develop the IoT devices with help of Tools	
CO6	Apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis	

4. 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 – SkyNetIoT Messaging Platform.

UNIT - V: DATA ANALYTICES AND TOOLS FOR IOT

Introduction – Apache Hadoop – Using HadoopMapReduce 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

5. **TEXT BOOK**
   1) ArshdeepBahga, 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

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

7. **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

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