SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES

PG DEPARTMENT OF COMPUTER APPLICATIONS

BCA
2020 - 2023

HOLY CROSS COLLEGE (AUTONOMOUS)
Affiliated to Bharathidasan University
Nationally Accredited (4th Cycle) with A++Grade (CGPA 3.75/4) by NAAC
College with Potential for Excellence
Tiruchirappalli – 620002

SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
Programme: B.C.A.

PO No.	Programme Outcomes *Upon completion of the B.C.A. Degree Programme, the graduate will be able to*
PO-1	Attain excellence in the area of Computer Applications
PO-2	Utilize the practical skill to examine, plan and engineer the applications of technology using computing tools and techniques
PO-3	Design innovative methodologies/techniques/ideas for solving real time problems to cater to the need for the society.
PO-4	Create student employability and be competent enough to work in IT industry.
PO-5	Integrate ethical values in designing computer applications

PSO No.	Programme Specific Outcomes *Upon completion of these courses the student would*
PSO-1	Acquire advanced knowledge in various areas of computer Applications
PSO-2	Analyze and find the best techniques for solving computational problem
PSO-3	Develop competent technical writing skills for software
PSO-4	Apply the recent technology in various domains and evaluate the methods of implementing it.
PSO-5	Design and Create innovative ideas that meet the requirements of software industry

(For Candidates admitted in the academic year 2020-2021)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 2
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
UG COURSE PATTERN
B.C.A.

Semester	Part	Course	Title of the Course	Code	Hours/ Week	Credits	Marks
I	I	Language	Tamil Paper I/ Hindi Paper I/ French Paper I	U20TL1GEN01/ U20HN1HIN01/ U20FR1FRE01	3	3	100
	II	English	English Paper I	U20EL1GEN01	3	3	100
	III	Major Core -1	Problem Solving using C	U20CA1MCT01	5	4	100
		Major Core - 2	Problem Solving using C – Lab	U20CA1MCP02	4	2	100
		Major Core - 3	Web designing and PHP – Lab	U20CA1MCP03	4	3	100
		Allied – 1	Statistical Methods	U20MA1ALT03	4	2	100
		Allied – 2	Basics Of Accounting	U20CO1ALT02	4	2	100
	IV	Environmental Studies	Environmental Studies	U20RE1EST01	2	1	100
		Value Education	Ethics I/ Bible Studies I/ Catechism I	U20VE2LVE01/ U20VE2LVB01/ U20VE2LVC01	1	-	-
	VI	Service Oriented Course		-	-	-	-
		Internship / Field Work / Field Project 30 Hours - Extra Credit		U20SP1ECC01	-	2	100
		TOTAL			**30**	**20+2**	**800+ 100**

Semester	Part	Course	Title of the course	Code	Hours/ Week	Credits	Marks
II	I	Language	Tamil Paper II/ Hindi Paper II/ French Paper II	U20TL2GEN02/ U20HN2HIN02/ U20FR2FRE02	3	3	100
	II	English	English Paper II	U20EL2GEN02	3	3	100
	III	Major Core – 4	Data Structures and Algorithms	U20CA2MCT04	5	4	100
		Major Core – 5	Digital Principles and Computer Architecture	U20CA2MCT05	4	3	100
		Major Core – 6	Optimization Techniques	U20CA2MCT06	5	4	100
		Allied – 3	Numerical Methods	U20MA2ALT10	4	2	100
	IV	Skill Based Course(SBC) – 1	Soft Skills Development	U20SS2SBC01	2	1	100
		Skill Based Course(SBC) – 2	Sustainable Rural Development and Student Social Responsibility	U20RE2SBC02	2	1	100
		Industrial Relation	Industrial Relation	U20CA2IRT01	1	1	100
		Value Education	Ethics I / Bible Studies I/ Catechism I	U20VE2LVE01/ U20VE2LVB01/ U20VE2LVC01	1	1	100
	VI	Service Oriented Course		-	-	-	
		Internship / Field Work / Field Project 30 Hours - Extra Credit		U20SP2ECC02		2	100
		TOTAL			**30**	**23+2**	**1000+100**

Semester	Part	Course	Title of the course	Code	Hours/ Week	Credits	Marks
III	I	Language	Tamil Paper III/ Hindi Paper III/ French Paper III	U20TL3GEN03 U20HN3HIN03 U20FR3FRE03	3	3	100
	II	English	English Paper III	U20EL3GEN03	3	3	100
	III	Major Core – 7	Database Systems	U20CA3MCT07	5	4	100
		Major Core – 8	Database Management Systems - Lab	U20CA3MCP08	4	3	100
		Allied – 4	Discrete Mathematics	U20MA3ALT12	4	2	100
		Major Elective -1	Major Elective –1	-	4	3	100
	IV	Major Skill Based Elective – 1	Front Office Tools - Lab	U20CA3SBP01	2	1	100
		Non Major Elective-1	Non Major Elective –1	-	3	3	100
		Gender Studies	Gender Studies	U20WS3GST01	1	1	100
		Value Education	Ethics II / Bible Studies II/ Catechism II	U20VE4LVE02/ U20VE4LVB02/ U20VE4LVC02	1	-	-
	VI	Service Oriented Course		-	-	-	
		Internship / Field Work / Field Project 30 Hours - Extra Credit		U20SP3ECC03	-	2	100
		TOTAL			30	23+2	900+ 100

Semester	Part	Course	Title of the course	Code	Hours/ Week	Credits	Marks
IV	I	Language	Tamil Paper IV/ Hindi Paper IV/ French Paper IV	U20TL4GEN04 U20HN4HIN04 U20FR4FRE04	3	3	100
	II	English	English Paper IV	U20EL4GEN04	3	3	100
	III	Major Core – 9	Java Programming	U20CA4MCT09	4	4	100
		Major Core – 10	Java Programming - Lab	U20CA4MCP10	4	3	100
		Major Elective –2	Major Elective –2	-	4	3	100
		Allied – 5	Cost & Management Accounting	U20CO4ALT07	4	2	100
		Allied – 6	Business Software – Tally	U20CO4ALP08	4	2	100
	IV	Non Major Elective – 2	Non Major Elective–2	-	3	3	100
		Value Education	Ethics II / Bible Studies II/ Catechism II	U20VE4LVE02/ U20VE4LVB02/ U20VE4LVC02/	1	1	100
	VI	Service Oriented Course		-	-	2	100
		Internship / Field Work / Field Project 30 Hours - Extra Credit	U20SP4ECC04			2	100
		TOTAL			30	24+2+2	900+100 +100

Semester	Part	Course	Title of the course	Code	Hours/ Week	Credits	Marks
V	III	Major Core –11	Software Engineering Concepts	U20CA5MCT11	4	4	100
		Major Core –12	Cloud Computing	U20CA5MCT12	4	4	100
		Major Core –13	Computer Networks	U20CA5MCT13	4	4	100
		Major Core –14	Object-Oriented Programming Using C# and .Net – Lab	U20CA5MCP14	4	4	100
		Major Core –15	Graph Theory	U20CA5MCT15	4	3	100
		Major Elective–3	Major Elective–3	-	4	3	100
	IV	Non Major Elective – 3	Non MajorElective– 3	-	3	3	100
		Major Skill Based Elective – 2	Multimedia – Lab	U20CA5SBP02	2	1	100
		Value Education	Ethics I / Bible Studies I/ Catechism I	U20VE6LVE03/ U20VE6LVB03/ U20VE6LVC03	1	-	-
	VI		Online Course	U20OC5ECT01	-	2	100
			Internship / Field Work / Field Project 30 Hours - Extra Credit	U20SP5ECC05		2	100
		TOTAL			30	26+2+2	800+ 100+ 100

Semester	Part	Course	Title of thecourse	Code	Hours/ Week	Credits	Marks
VI	III	Major Core –16	Operating Systems	U20CA6MCT16	4	4	100
		Major Core –17	Computer Graphics	U20CA6MCT17	4	3	100
		Major Core – 18	Internet of Things	U20CA6MCT18	4	3	100
		Major Core – 19	Big Data Analytics	U20CA6MCT19	4	3	100
		Major Core–20	Information and Cyber Security	U20CA6MCT20	4	4	100
		Major Elective– 4	Major Elective- 4	-	4	3	100
	IV	Non Major Elective – 4	Non Major Elective – 4	-	3	3	100
		Skill Based Course(SBC) – 3	Research Methodology	U20DS6SBC03	2	1	100
		Value Education	Ethics III / Bible Studies III/ Catechism III	U20VE6LVE03/ U20VE6LVB03/ U20VE6LVC03	1	--	100
	V	Extension Activity	Rescapes - Impact Study of Project	U20RE6ETF01	-	2	100
	VI	Internship / Field Work / Field Project 30 Hours - Extra Credit		U20SP6ECC06	-	2	100
		TOTAL			30	24+2+2	**800+100 +100**
		GRAND TOTAL			180	140+6+12	**5300+300 +600**
VI		ED: Extra credit(Mini Project)		U20CA6ECP01	-	2	100

LIST OF ALLIED PAPERS OFFERRED BY THE DEPARTMENT TO OTHER DEPARTMENTS

School Pattern

Semester	Part	Course and Department	Title of the Course	Code	Hours/ Week	Credits	Marks
II	III	B.Com.(CA)	Computer Applications in Business	U20CA2ALT01	4	2	100
III	III	B.COM(CA)	R Programming – Lab	U20CA3ALP04	4	2	100
III	III	B.Sc. Physics	Database Management Systems	U20CA3ALT05	4	2	100
IV	III	B.Com.(CA)	Relational Database Management System	U20CA4ALT06	4	2	100
IV	III	B.Sc. Physics	Programming in C	U20CA4ALT07	4	2	100
IV	III	B.Sc. Physics	Programming in C - Lab	U20CA4ALP08	4	2	100

LIST OF MAJOR ELECTIVE COURSES OFFERED BY THE DEPARTMENT:

Semester	Part	Course	Title of the Course	Code	Hrs / Wk	Credits	Marks
III	III	Major Elective -1	Emerging Trends in IT/ Basic Concepts of Programming	U20CA3MET01/ U20CA3MET02	4	3	100
IV	III	Major Elective –2	Ethical Hacking/ Web Application Technologies –PHP & MySQL	U20CA4MET03/ U20CA4MET04	4	3	100
V	III	Major Elective–3	Introduction to Python Programming/ Fundamentals of Programming	U20CA5MEP05/ U20CA5MET06	4	3	100
VI	III	Major Elective– 4	Data Analytics Tools -Lab/ Software Testing - Lab	U20CA6MEP07/ U20CA6MEP08	4	3	100

Semester	Part	Course	Title of the Course	Code	Hrs / Wk	Credits	Marks
VI	III	Major Elective -4	Business Data Analytics – Lab (Commerce CA)	U20CA6MEP09	4	3	100

LIST OF NON MAJOR ELECTIVE COURSES OFFERED BY THE DEPARTMENT:

Semester	Part	Course	Title of the Course	Code	Hrs / Wk	Credits	Marks
III	IV	Non Major Elective-1	Basic Drawing and Editing Lab	U20CA3NMP01	3	3	100
IV	IV	Non Major Elective - 2	Digital Art Lab	U20CA4NMP02	3	3	100
V	IV	Non Major Elective - 3	Data Analytics using R - Lab	U20CA5NMP03	3	3	100
VI	IV	Non Major Elective - 4	Computer Awareness for Competitive Examinations	U20CA6NMT04	3	3	100

Major Skill Based Elective Courses offered by our Department:

Semester	Part	Course	Title of the Course	Code	Hrs/ Wk	Credits	Marks
II	III	Rehab.Science	**Major Skill Based Elective - 1** Office Automation for Social Sciences	U20CA2SBP01	2	1	100

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA COMPUTER SCIENCE
First Year - Semester – I

Course Title	Major Core :1-Problem Solving using C
Total Hours	75
Hours/Week	5
Code	U20CA1MCT01
Course Type	Theory
Credits	4
Marks	100

GENERAL OBJECTIVE
To understand the concepts of problem solving approaches and to develop programming skills using C language.

COURSE OBJECTIVES
The learner will be able to

CO No.	Course Objectives
CO-1	Understand the concepts of algorithms and create flowcharts for a given problem
CO-2	Apply the basic concepts of C in real-time applications
CO-3	Analyze the control constructs, different types of arrays and apply the concepts for solving problems in real time
CO-4	Understand the concepts of strings, user defined functions, structures and union in C
CO-5	Understand the basics of pointers and create files using C

UNIT I   **15 Hrs**
INTRODUCTION TO COMPUTER PROBLEM SOLVING
Introduction: Steps involved in Problem Solving Using Computers – Algorithms – Flow Charts – Pseudocode – Evolution of Programming Languages: Introduction – Classification of Programming Languages - Compiler – Interpreter, Loader and Linker.
Extra Reading: Develop Algorithms for real time applications.

UNIT II   **15 Hrs**
CONSTANTS, VARIABLES, AND DATA TYPES: Introduction – Character Set – C Tokens – Keywords and Identifiers – Constants – Variables – Data Types – Declaration of Storage Class.
OPERATORS AND EXPRESSIONS: Introduction - Arithmetic Operators - Relational Operators - Logical Operators - Assignment Operators - Increment and Decrement Operators- Conditional Operators - Bitwise Operators -   Special Operators - Arithmetic Expressions - Evaluation of Expressions - Precedence of Arithmetic Operators - Some Computational Problems.
MANAGING INPUT AND OUTPUT OPERATORS: Introduction - Formatted Input – Formatted Output.
Extra Reading: Basic I/O and Control operations in Python.

UNIT III   **15 Hrs**
DECISION MAKING AND BRANCHING: Introduction - Decision Making with if Statement - Simple if Statement- The if else Statement - Nesting of if...else Statements - The Else if Ladder -

Switch Statement - ?: Operator – Goto Statement.

DECISION MAKINGAND LOOPING: Introduction – The While Statement - The do Statement – The for Statement - Jumps in Loops.

ARRAYS: Introduction – One-dimensional Array – Two-dimensional Arrays - Initializing Two - dimensional Arrays – Multi-dimensional Arrays.

Extra Reading: Develop multidimensional array programs

UNIT IV **15 Hrs**

HANDLING OF CHARACTER STRINGS: Introduction - Declaring and Initializing String Variables - Arithmetic Operations on Characters - String- handling Functions - Table of Strings.

USER DEFINED FUNCTIONS: Introduction - Definition of Functions - Function Declaration - Category of functions - No Arguments and No Return Values - Argument but No Return Values - Arguments with Return Values – No Arguments but Returns a Value – Functions that Return Multiple Values – Recursion.

STRUCTURES AND UNIONS : Introduction – Defining a Structure - Declaring Structure Variables – Accessing Structure Members - Structure Initialization - Arrays of Structures - Arrays Within Structures – Structures Within Structures - Structures and Functions –Unions.

Extra Reading: Create Programs using functions.

UNIT V **15 Hrs**

POINTERS: POINTERS : Introduction - Understanding Pointers - Accessing the Address of a Variable - Declaring and Initializing Pointers - Accessing a Variable through its Pointer - Chain of Pointers - Pointer Expressions - Pointers and Arrays - Pointers and Character Strings – Arrays of Pointers - Pointers to Functions – Pointers andStructures.

FILE MANAGEMENT IN C: Introduction - Defining and Opening a File - Closing a File - Input/Output Operations on Files - Error Handling during I/O Operations - Random Access to Files - Command Line Arguments.

Extra Reading/Keywords: Implement the system and file concepts using emulator.

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.

COURSE OUTCOMES (CO):
The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Know the correct and efficient ways of solving problems.	PSO1, PSO2	U
CO-2	Write C program for simple applications	PSO 2	An
CO-3	Formulate algorithm for simple problems	PSO 2	U
CO-4	Analyze different data types and arrays	PSO 5	An
CO-5	Perform simple search and sort	PSO 1	Ap
CO-6	Understand memory management and write programs using structures and union for solving complex computational Problem	PSO2, PSO3	U
CO-7	Create files and perform file operations using C	PSO 1, PSO5	R, An
CO-8	Use programming language to solve problems	PSO1, PSO5	E

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT BOOKS
1. M. T. Somashekara, "Problem Solving with C", PHI Learning Private Limited, 2009.
2. E. Balagurusamy, "Programming in ANSI C", Seventh Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2017.

BOOKS FOR REFERENCE
1. BrianW. Kernighan and Dennis M. Ritchie, **"The C programming Language"**, Prentice-Hall Publishing Company, 2006.
2. Deitel and Deitel, **"C How to Program"**, Seventh Edition, Pearson Education Pvt. Ltd., 2013.
3. R.G.Dromey, **"How to Solve it by Computer"**, Fifth Edition, Pearson Education Pvt. Ltd., New Delhi, 2007.
4. Kamthane, A.N., **"Programming with ANSI and Turbo C"**, Pearson Education Pvt. Ltd., New Delhi,2006.
5. K R Venugopal ,Sudeep R Prasad, **"Mastering C"**, Second Edition, McGraw Hill Education Private Limited, 2015.

HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA.
First Year - Semester – I

Course Title	Major Core : 2- Problem Solving using C-Lab
Total Hours	60
Hours/Week	4
Code	U20CA1MCP02
Course Type	Practical
Credits	2
Marks	100

GENERAL OBJECTIVE
   The student writes application programs using C for solving real time problems.
COURSE OBJECTIVES
The learner will be able to

CO No.	Course Objectives
CO-1	Recall the syntax of control structures and solve problems using C
CO-2	Remember the syntax of looping statements and solve problems using C
CO-3	Create programs for arrays and strings using C
CO-4	Develop programs for Functions, Pointers and Structures in C
CO-5	Write programs for creating a file and perform I/O operation on files

EXERCISES

1. Control Statements

2. Loop Statements

3. Arrays (Searching and Sorting)

4. Strings

5. Functions and Pointers

6. Structure and Union

7. Dynamic Memory Allocation

8. Macros and File Handling

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CHOICE BASED CREDIT SYSTEM
BCA
First Year - Semester – I

Course Title	Major Core : 3 - Web designing and PHP-Lab
Total Hours	60
Hours/Week	4
Code	U20CA1MCP03
Course Type	Practical
Credits	3
Marks	100

GENERAL OBJECTIVES
   To discuss and develop websites using script type, style sheets, jquery, html and php languages.
COURSE OBJECTIVES
The learner will be able to

Co No.	Course Objectives
CO-1	Understand the basic concepts of html and stylesheets.
CO-2	Perform basic operations using CSS
CO-3	Learn how to use jquery for effective website creation
CO-4	Learn various functions of MySQL
CO-5	Understand the Scripting language of website creation

HTML5 & CSS:

1. Create a HTML page that will have the following: Headers, Linking and Images.
2. Create a HTML page that will have the following: Frames, Unordered Lists, Nested and Ordered Lists.
3. Create a HTML page that will have the following: Tables and Formatting.
4. Create a HTML page that will have the following: Forms, Creating and Using Image Maps, Tags.
JAVA SCRIPT:

1. Write a script to generate Random Numbers within 1 to 10 and display the numbers in a Table.
2. Write a script to create an Arithmetic Calculator using Function.
3. Write a script to check the given String is Palindrome or not.
JQUERY:

1. Write a program to display the Week Days.
2. Write a program to generate Date and Time in different format.
3. Write a program to Validate Age and Numeric Value.
PHP & MySQL:
1. Creating a simple PHP program using the concepts: Flow Control, Strings and Arrays, creating Functions.
2. FORM processing using PHP.
3. Connecting to MySQL from PHP, PHP MySQL Connectivity, Creating Databases and Tables with PHP Programs: Storing data and Retrieving data.

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
First Year - Semester – II

Course Title	Major Core : 4 - Data Structures and Algorithms
Total Hours	75
Hours/Week	5
Code	U20CA2MCT04
Course Type	Theory
Credits	4
Marks	100

GENERAL OBJECTIVE
    To understand the fundamental concepts of data structures and learn to develop algorithms.

COURSE OBJECTIVES
 The learner will be able to

CO No.	Course Objectives
CO-1	Learn the fundamental Concepts of Data Structures.
CO-2	Understand the working principles of Queues and Linked Lists.
CO-3	Study how to balance a Binary Search trees and 2-3 and so on other Trees.
CO-4	Understanding of various sorting algorithms, including insertion sort, selection sort, merge sort, heap sort and quick sort.
CO-5	Understand the concepts of Graphs and its terminologies.

UNIT-I   **15Hrs**
INTRODUCTION TO DATA STRUCTURE: Definitions – Overview of Data Structures - Implementation of Data Structures. **ARRAYS:** Definition – Terminology – One-dimensional Array: Operations on Arrays. **STACK:** Definition and Example - Representing Stack: Implementing the Pop operation – **APPLICATIONS:** Infix, Postfix and Prefix; Basic Definitions and Examples – evaluating a Postfix Expression - Converting an Expression from infix to postfix.
Extra **Extra Reading /Key words:** *two dimensional and multi-dimensional arrayconcepts.*

UNIT-II   **15Hrs**
QUEUES: The Queue and its Sequential representation: The Queue as an Abstract Data Type – Insert Operation – Priority Queue – Array implementation of a Priority Queue.
LINKED LISTS: Inserting and Removing Nodes from a List – Linked implementation of Stacks – getnode and freenode operations – Linked implementation of Queues – Linked list as a Data Strucutre – Header nodes.
Extra Reading /Key words: *real time applications of Stacks & Linked Lists.*

UNIT-III   **15Hrs**
TREES: BINARY TREES: Operations on Binary trees – Applications of Binary Trees. **BINARY TREE REPRESENTATIONS**: Node representation of Binary Trees – Internal and External Nodes.
APPLICATIONS: Tree Traversals – General Expression as Trees – Evaluating an

Expression tree – Constructing a Tree.
Extra Reading /Key words: *Tree Traversals, Binary Search Tree.*

UNIT-IV   **15Hrs**
SORTING: Bubble Sort – Quick Sort – Heap Sort; Insertion Sort: Simple Insertion – Shell Sort – Merge Sort.
Extra Reading /Key words: *Applications of Sorting Techniques.*

UNIT-V   **15Hrs**
GRAPHS: Introduction- Graph terminologies - Representation of Graphs: Set Representations – Linked Representations - Transitive Closure - Warshall"s Algorithm – Shortest Path Algorithm – Dijkstra's Algorithm Revisited**.**
Extra Reading /Key words: *cyclic and acyclic graph, shortest path.*

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.

COURSE OUTCOMES (CO):
The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recall the fundamental Concepts of Data Structures.	PSO 1	R, U
CO-2	Determine the applications of, Queues and Linked Lists.	PSO 2	A
CO-3	Grasp various operations and searching methods applied using Binary Tree.	PSO 2	U
CO-4	Demonstrate of various sorting algorithms, including insertion sort, selection sort, merge sort, heap sort and quick sort.	PSO 3	Ap
CO-5	Demonstrate Shortest Path Algorithms	PSO 4	An

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT BOOKS

1.Samanta D, **Classic Data Structures**, 2005, Prentice Hall of India Private Ltd, New Delhi. Unit – I, V.
2. YedidyahLangsam, Moshe J. Augenstein, Aaron M. Tenenbaum, "DataStructures Using C and C++", 2006, SecondEdition.
                Unit – I, II, III, IV, V.

BOOKS FOR REFERENCE

1. Ellis Horowitz, SartajSahni and Dinesh Mehta, "Fundamentals of Data Structures in C++", University Press (India) Pvt. Ltd., Hyderabad, 2007.
2. Yashavant P. Kanetkar, "Data Structures Through C++", BPB Publications, 2003.
3. A. Chitra and P.T. Rajan, Data Structures, Tata McGraw – Hill Publishing Company Limited, New Delhi,2006.
4. Jean Paul Tremblay and Paul G. Sorenson, An Introduction To Data Structures with Applications, Tata McGraw-Hill, Second Edition, 2007.
5. S.E. Goodman and S.T. Hedetniemi, "Introduction to the Design and Analysis of Algorithms", Tata McGrawHill, International Edition, 1987.

(For Candidates admitted from the academic year 2020-21 onwards)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI- 2
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER SCIENCE
B.C.A
First Year - Semester – II

Course Title	Major Core 5 – Digital Principles and Computer Architecture
Total Hours	60
Hours/Week	4HrsWk
Code	U20CA2MCT05
Course Type	Theory
Credits	3
Marks	100

General Objectives:
To give Basic Knowledge on Various Building Blocks of a Digital Computer and Architecture.

Course Objectives:
The learner will be able to

CO No.	Course Objectives
CO-1	Understand and learn the types of number systems and basic theorems and properties of Boolean algebra.
CO-2	Learn and understand the types of flipflops, registers and counters.
CO-3	Know and understand the categories of the peripheral devices and its data transfer.
CO-4	Learn and understandthe instruction formats, addressing, modernpipelining and vector processing techniques.
CO-5	Know and understand the main memory, auxiliary memory, associative, cache and virtual memory.

UNIT I 12Hrs
NUMBER SYSTEMS: Binary, Decimal, Octal, Hexadecimal – Conversion from one to another – Complements – ASCII – Excess 3 – Gray – Parity Generator and Checker.
DIGITAL LOGIC: Basic Logic Gates - Basic theorems and properties of Boolean algebra - NAND, NOR Implementation – K- Map – Pairs, Quads, Octet – K map Simplification – Sum of Product and Product of Sum – Don‟t Care conditions.

UNIT II 12Hrs
COMBINATIONAL LOGIC CIRCUITS DESIGN: Multiplexers – De multiplexers – Encoders – Decoders - Arithmetic Building blocks – Half Adder – Full Adder –Half Subtractor – Full Subtractor.
FLIPFLOPS, REGISTERS, COUNTERS: RS FlipFlop – JK FlipFlop – D Flipflop – T Flipflop – Edge triggered Flipflop – Master – Slave Flipflop –Types of Registers – Serial in Serial Out – Serial in Parallel out – Parallel in Serial out – Parallel in Parallel out – Counters – Ripple counter.

UNIT III 12Hrs
INPUT – OUTPUT ORGANIZATION: Peripheral Devices -- Input Output Interface – Asynchronous Data Transfer – Modes of Transfer – Priority Interrupt – Direct Memory Access.

UNIT IV   **12Hrs**
CENTRAL PROCESSING UNIT: General Register Organization – Stack Organization – Instruction Formats – Addressing Modes – Data Transfer and Manipulation.
PIPELINE AND VECTOR PROCESSING: Parallel Processing – Pipelining – Arithmetic Pipeline – Instruction Pipeline – RISC Pipeline – Vector Processing.

UNIT V   **12Hrs**
MEMORY ORGANIZATION: Memory Hierarchy – Main Memory – RAM and ROM Chips – Memory Address Map – Memory Connection to CPU – Auxiliary Memory – Magnetic Tape – Associative Memory -- Cache Memory – Virtual Memory – Memory Management Hardware.
Course Outcomes (CO):
The learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Describe the types of number systems.	PSO 1	R, U
CO-2	Explain the arithmetic building blocks	PSO 2	U
CO-3	Illustrate the concept of flipflops,registers and counters	PSO 2	U
CO-4	Ilustrate the concepts of transfer of data.	PSO 3	U
CO-5	Differentiate different types of addressing modes and explain pipeline and vector processing.	PSO 4	An
CO-6	Analyze the various types of Memory and the purpose of Memory Management.	PSO 4	An

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT
1. Albert Paul Malvino, Donald. P.Leach , Digital Principles and Applications, 2002, Tata McGraw-Hill Publishing Company Limited, New Delhi.
UNIT I   : Chapters 2.1 -2.7, 3.1 - 3.8, 5.1 – 5.8
UNIT II   : Chapters 8.1 – 8.7, 9.1 – 9.5, 10.1 – 10.3,4.1 – 4.3 ,4.6
2.M.Morris Mono, Computer System Architecture, Third Edition,2005,Prentice – Hall of India Private Ltd, New Delhi.
UNIT III   : Chapters 11
UNIT IV   : Chapters 8.1 – 8.6, 9.1 – 9.6
UNIT V   : Chapters 12

BOOKS FOR REFERENCE
1. B.Govinderajalu, "Computer Architecture and Organization",2004 ,Tata McGraw – Hill Publishing Company, New Delhi.
2. William Stallings, "Computer Organization and Architecture ", 2006, 7th Edition, Pearson Education.
3. Carl Hamacher, AuonkoUranesic and SafwatZaky , "Computer Organization", 2002, 5th Edition, Tata McGraw – Hill Publishing Company, New Delhi.
4. Kai Hwang , "Advanced Computer Architecture" , 2000, Tata McGraw – Hill Publishing Company, New Delhi.
5.P.Pal Chaudhuri, "Computer Organization and Design",2008, 3rd Edition , Prentice Hall of India Pvt Ltd, New Delhi.

(For Candidates admitted from the academic year 2020-21onwards)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICAIONS
CHOICE BASED CREDIT SYSTEM
BCA
First Year - Semester – II

Course Title	MAJOR CORE- 6: OPTIMIZATION TECHNIQUES
Total Hours	75
Hours / Week	5 Hrs/Wk
Code	U20CA2MCT06
Course type	Theory
Credits	4
Marks	100

GENERAL OBJECTIVE
To enable the students to convert any real life situation into a mathematical model and solve them using an appropriate algorithm.

COURSE OBJECTIVES
The learner will be able to

CO No.	Course Objectives
CO – 1	Understand L.P.P and finding solution by Graphical and Simplex Method.
CO – 2	Evaluate of solution of L.P.P by Big M method and Two phase Method
CO – 3	Understand sequencing problem and obtaining the sequence of processing n jobs through two machine and k machines
CO – 4	Understand inventory control theory and finding EOQ
CO – 5	Evaluate PERT and CPM.

UNIT I: LINEAR PROGRAMMING PROBLEM AND SIMPLEX ALGORITHM. 15 Hrs
Introduction to OR - Mathematical formulation of the problem - Graphical solution methods - General Linear Programming Problem - Canonical and standard forms of L.P.P.The Simplex Method - Simplex Algorithm.
Extra Reading/ Keywords: *Revised simplex method, Dual simplex method.*

UNIT II : ARTIFICIAL VARIABLES ANDSEQUENCING PROBLEM   15 Hrs
Artificial variables - Charnes Method of penalties (Big - M method) - Two-Phase Simplex method – Sequencing problem - processing n jobs through two machines - processing n jobs through k machines.
Extra Reading/ Keywords: *Fractional cut method ,Processing 2 jobs through k machines*

UNIT III : TRANSPORTATION PROBLEM ANDASSIGNMENTPROBLEM   15 Hrs
Transportation Problem - Initial basic feasible solution - North west corner rule - Row minima method - Column minima method - Matrix minima Method - Vogel's approximation method - Optimal solution - u - v method - Degeneracy - Unbalanced Transportation Problem-Assignment problem-Hungarian method-unbalanced assignment problem, Travelling salesman problem.
Extra Reading/ Keywords :*Stepping stone solution method, Dual of the Assignment problem*

UNIT IV: INVENTORY CONTROL   15 Hrs
Types of inventory - Economic order quantity - Deterministic inventory problems with shortages - Deterministic inventory problems without shortages - Problems of EOQ with price breaks.
Extra Reading/ Keywords: Multi-item Deterministic problems

UNIT V:NETWORK SCHEDULING   15 Hrs
Introduction to network problems - Network scheduling by CPM and PERT.
Extra Reading/ Keywords: *Time cost Optimization Algorithm, Resource allocation and scheduling*

Note: Tests given in the Extra Reading /Key Word: must be tested only through assignment and seminars.

COURSE OUTCOMES (CO):
  The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO – 1	Recall L.P.P and Solving LPP by Graphical and Simplex Method	**PSO - 3**	**U,E**
CO – 2	Solve L.P.P by Big M method and Two phase Method	**PSO -2**	**E**
CO – 3	Recognize and solve sequencing problem	**PSO -4**	**E**
CO – 4	Discuss inventory control theory and computeEOQ.	**PSO -1**	**U,E**
CO – 5	Evaluate PERT and CPM	**PSO -5**	**E**
CO – 6	Enable the students to convert any real life situation into a mathematical model and solve them using an appropriate algorithm- Skill Development	**PSO – 1, PSO -2**	**U,E**

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT BOOKS

Kantiswarup, P.K.Gupta & Man Mohan , (2009) <u>OPERATIONS RESEARCH</u>
UNIT - I - Chapters 2 ,Chapter 3 : 3.1 -3.5 ,Chapter 4: 4.1- 4.3
UNIT II- Chpter 4: 4.4 ;Chapter 12:12:1-12:5
UNIT III - Chapter 10 : 10.1 – 10.3 , 10.5, 10.8 -10.13,10.15, Chapter 11-11.1 to 11.4,11.7
UNIT IV - Chapter 19: 19.1 - 19:12
UNIT V - Chapter 25

BOOKS FOR REFERENCE

1.H. Taha(IV Edition) <u>OPERATIONS RESEARCH</u> ,Prentice Hall of India 2006.
2.P. K. Gupta, D. S. Hira, (2001) <u>PROBLEMS IN OPERATIONS RESEARCH</u>, S.Chand ,New
   Delhi.

HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI- 2
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER SCIENCE
B.COM. CA
First Year - Semester – II.

Course Title	ALLIED OPTIONAL 1 COMPUTER APPLICATIONS IN BUSINESS
Total Hours	60
Hours/Week	4 HrsWk
Code	U20CA2ALT01
Course Type	Theory
Credits	2
Marks	100

General Objectives:

To make the students familiar with the use of IT and the various facets of IT and to equip the students with practical skills to use computers.

Course Objectives:
The learner will be able to

CO No.	Course Objectives
CO-1	understands the components, different applications and issues of information technology
CO-2	remembers and understands the terminologies of operating system and features of Microsoft Word
CO-3	explain the features of Excel environment
CO-4	create power point presentation with multimedia effects
CO-5	solve ecommerce framework with real-time applications.

UNIT I   **12 Hrs**
INFORMATION TECHNOLOGY: Introduction: Meaning – Need – Components. **Role of IT**: It in Business, IT in Manufacturing, IT in Mobile Computing, IT in Public Sector, IT in Defense, IT in Media, IT in Publication, IT and Internet. **Emerging Trends in IT**: E-Commerce, IT And Supply Chain Management, IT And SIS, Electronic Data Interchange(EDI) and Mobile Communication. **IT and Ethical Issues:** Privacy, Accuracy, Property and Accessibility Issues.
Extra Reading /Key Words: Cyber Law Security and Practices

UNIT II   **12 Hrs**
BASICS OF OPERATING SYSTEMS: Meaning, Definition and Functions of OS. **Microsoft Window 2007**: Task Bar, Desktop and Customizing, My Computer-Setting, Control Panel Components, Windows Explorer, Using Help and Search Features. **Word Processing Using MS Word 2007**: Basics - Working with Word documents – Working with Text. *Checking Spelling and Grammar*: Using Spelling and Grammar Dialog Box - Using Auto Correct- Using Synonyms and Thesaurus. Adding Graphics and Drawing Objects – Mail Merge.
Extra Reading /Key Words: Distributed Operating System

UNIT III   **12 Hrs**
MS-EXCEL : Spread Sheet Using Microsoft Excel 2007: Excel Environment – *Working With Worksheet*: Entering Data – Navigating Through Cells – Naming And Renaming Cells – Editing A Worksheet – Cut-Copy, Paste Functions - Find And Replace Features. *Formulas and Functions*: Functions and Formulas - Using Auto Sum, Auto Fill and Command. Creating and Inserting a Chart and Transporting to Word and PowerPoint Documents.
Extra Reading /Key Words: Import Excel to analysis tools

UNIT IV   **12 Hrs**
MS-POWER POINT: *Making Presentation Using Microsoft Power Point 2007*. PowerPoint Environment – *Working with PowerPoint*: Creating a Presentation using Design Templates and Blank Presentation - Working with Different Views. *Designing Presentation*: Working with Slides – Working with Text – Formatting the Text - Graphics and Adding Multimedia Animation - Inserting Pictures and Tables From Other Office Products – Running Slides.
Extra Reading /Key Words: Presentation with Hyperlink and Animation.

UNIT V   **12 Hrs**
APPLICATIONS OF E-COMMERCE: *Introduction to E-Commerce*: Meaning, Need, Advantages, E-Commerce Framework, Types of E-Commerce. *The Anatomy of E-Commerce Applications*: Electric Consumer Application - Electronic Commerce Organization Application. *Electronic Payment System*: Introduction to EPS, EFT and SET - Types of Payment System. *Technology and Cyber Law*: Basics Concepts and Importance of Cyber Law - Cyber Laws in India (Information Technology Act 2000).
Extra Reading /Key Words: Usage of E-purchase Websites

Course Outcomes:
The learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Describe the Components, different Applications and issues of Information Technology.	PSO 1	R, U
CO-2	Discuss the terminologies of Operating System and features of Microsoft Word.	PSO 1, 2	R, Ap
CO-3	Explain the features of Excel Environment.	PSO 1, 4, 5	U, Ap, E
CO-4	Create Power Point Presentation with Multimedia Effects.	PSO 3, 5	R, Ap
CO-5	Relate Ecommerce Framework with Real-Time Applications.	PSO 4,5	R, Ap

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT

1. Alexis Leon, Mathews Leon, Leena Leon, "**Introduction to Information Technology**", Vijay Nicole, imprints Private Ltd, Chennai.

2. R. Parameswaran, "**Computer Applications in Business**", S.Chand& Company Ltd. New Delhi.

BOOKS FOR REFERENCE

1. V. Rajaraman, "**Introduction to Information Technology**", PHI Learning Pvt Ltd, New Delhi.

2. Dr. Ch. Seetha ram, "**Information Technology For Management**", Deep& Deep Publications Pvt Ltd, New Delhi.

3. Leon, "**Introduction to Computers**", Vikas Publishing House Pvt Ltd.

4. Srinivasavallaban SV, "**Computer In Business**", Sultan Chand and Sons, New Delhi.

5. "**Introduction to Computers with Ms Office**", New Delhi

PRACTICALS

1. Typing and formatting a page in MS Word

2. Typing all kinds of letters

3. Typing a Resume

4. Creation of tables in MS Word and entering text and numeric data

5. Use of Mail merge

6. Preparing a graph for a given data

7. Creating power point file using templates and master slide

8. Importing data from word and excel to power point slides

9. Inserting picture files and audio files

10. Using animation and slide transition schemes in slides

11. Opening net banking account

12. Case study on Cyber Laws

HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI- 2
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER SCIENCE
Rehab
First Year – Semester II

Course Title	OFFICE AUTOMATION FOR SOCIAL SCIENCES
Total Hours	26
Hours/Week	2
Code	U20CA2SBP01
Course Type	Practical
Credits	1
Marks	100

General Objective:

To impart practical skills and knowledge on various application software used for office automation like Ms-Word, Ms-Excel and Ms-Powerpoint for creating documents, data analysis, graphical representations and preparing presentations.

Course Objectives:

CO No.	Course Objectives
CO-1	Understand to create a document, formatting the text, spell check and printing the document
CO-2	Creating a main and provide mass distribution of mails using Mail Merge and using tables to present textual and numerical data
CO-3	Apply Formatting to Spreadsheet for organizing the data
CO-4	Apply formulas in Spreadsheet and to analyze the data visually through graphical representations
CO-5	Apply text, graphics and multi-media effects to create professional presentations.

LIST OF PRACTICAL EXERCISES

MS-WORD :
1. Create and save a document and perform the following:
a. Insert an Image and a textbox
b. Deletion of Character, Word, line and block of text
c. Undo and redo process
d. Moving, Copying and renaming

2. Format the Text document using:
a. Character formatting
b. Paragraph formatting
c. Page formatting

3. Spell check the document using:
a. Finding and Replacing of text
b. Bookmarks and Searching for a Bookmarks

c. Checking Spelling and Grammar automatically
d. Checking Spelling and Grammar using Dictionary

4. Print the document using:
a. Print Preview
b. Print Dialog box

5. Mail Merge in MS-WORD
a. Create main document and data file for mail 15merging
b. Merging the files
c. From letters using mail merging
d. Mailing labels using mail merging

6. Table creation in MS-WORD
a. Create a table in the document
b. Add row, column to a table
c. Changing column width and row height.
d. Merge, split cells of table.
e. Use formulae in tables.
f. sorting data in a table.
g. formatting a table.

MS-EXCEL:
1. Create and save a new work book in Excel
    a. Entering Data into Worksheet
    b. Editing data of Worksheet
    c. Formatting the text in the cells
    d. Formatting the numbers in the cells
    f. Formatting cells.
    g. Copying format of cell along with data format.
    h. Changing the height and width of cells.
    i. Freezing Titles, splitting screen

2. Create a Student Worksheet with Reg. No., Name, Mark1, Mark2, Mark3, Mark4, Total, Average, Result and Class to perform the following:
a. Inserting built-in function Total & Average in to the cells
b. Copying the formula over a range of cells.
c.Enter formulae for calculation of Result and Class in the cells.

3. Create an Employee Worksheet with Empno, Name, Department, Designation, Basic Pay, HRA, DA, CCA, Allowances, PF, Housing Loan, Deductions, Gross Pay, Net Pay
  a. Use the formulas for calculating the Allowances, Deductions, Gross Pay, Net Pay
b. Create graphs for the data using Chart Wizard.
c. Format graphs in Excel.
d. Printing of worksheet

3. Create a Sales Data Worksheet and perform the following:
    a. Use Filters for displaying a particular information
    b. Use Pivot Tables
    c. Use Sorting
    d. Data Validation

MS-POWERPOINT:

1. Create and save a new presentation using MS Power Point

- layout of opening screen in Power Point
- the tool bars in MS Power Point
- Choose Auto Layout for a new slide.
- Insert text and pictures into a blank slide.
- Insert new slides into the presentation.
- Apply slide transition effects.
- Slide show.
- Set animation to text and pictures in a slide
- Set the sounds, order and timing for animation

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – III

Course Title	MAJOR CORE - 7 - DATABASE SYSTEMS
Total Hours	75
Hours/Week	5
Code	U20CA3MCT07
Course Type	Theory
Credits	4
Marks	100

GENERAL OBJECTIVE
To impart the fundamental aspects of database design, database languages and database-system implementation.

COURSE OBJECTIVES
To enable the learners:

CO No.	Course Objectives
CO-1	Understand, analyze the database, file management and data management system;
CO-2	Apply Structured Query Language to access data from database;
CO-3	Identify different data models and relate E-R model with relation;
CO-4	Apply Normalization techniques to refine database;
CO-5	Analyze Transaction Processing and Concurrency Control mechanism in database System.

CO – Course Objective

UNIT- I Introduction to DBMS   **15 Hrs**
Introduction to Database Systems: Basic Concepts and Definitions - Data Dictionary - Database - Database System - Data Administrator - Database Administrator - Database System Architecture: Three-level ANSI-SPARC Data Base Architecture - Data Independence – Mappings.
Extra Reading/Keywords*: DB Software, Big Data*

UNIT- II Structured Query Language   **15 Hrs**
Relational Query Languages: Query Language – Structured Query Language: Advantages and Disadvantages of SQL- Basic SQL Data Structure - SQL Data Types - SQL Operators - Data Definition Language - Data Query Language - Data Manipulation Language - Data Control Language - Data Administration Statements - Transaction Control Statements.
Extra Reading/Keywords*: PostgreSQL, Embedded SQL*

UNIT- III Types of Data Model 15 Hrs

Data Models: Record-Based Data Model-Object-Based Data Model-Physical Data Model-Hierarchical Data Model-Network Data Model- Relational Data Model-Object-Oriented Data Model-Comparisons between Data Model- Entity-Relational Model: Basic E-R Concepts – Conversion of E-R Model into Relations.

Extra Reading/Keywords: *EER Model, Advanced Data Analysis*

UNIT- IV Normalization 15 Hrs

Introduction – Normalization - Normal Forms - BCNF – Multi-value Dependencies and 4NF – Join Dependencies and 5NF- Query Processing: Introduction – Query Processing – Syntax Analyzer – Query Decomposition.

Extra Reading/Keywords: *6NF, ONF*

UNIT- V Transaction Processing 15 Hrs

Transaction Processing and Concurrency Control: Introduction - Transaction Concepts - Concurrency Control - Locking Methods for Concurrency Control – Database Recovery System: Database Recovery Concepts - Types of Database Failures - Types of Database Recovery.

Extra Reading/Keywords: *Web Server, Transaction Processing Monitor*

Note: Tests given in the Extra Reading /Keywords must be tested only through assignment and seminars.

COURSE OUTCOMES

The learners will be able to

CO.No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recall and Relate file management systems with DBMS;	PSO 1	R, U
CO-2	Design relations using Database Schema;	PSO 2,PSO 5	A
CO-3	Relate Relational Algebra Notation with Relation Operation to access the data;	PSO 2	An
CO-4	Differentiate and Refine the relations by applying normalization techniques;	PSO 4	An,E
CO-5	Sketch and Relate E-R diagrams with relations;	PSO 2	An
CO-6	Apply SQL queries to access the data;	PSO 4	Ap
CO-7	Understand Transaction concepts and Analyze Concurrency Control method;	PSO 1	U,An
CO-8	Differentiate types of Database failures and Database Recovery;	PSO 2	An

PSO – Programme Specific Outcome; CO – Course Outcome; R – Remember;U–Understand; Ap – Apply;An – Analyse; E– Evaluate; C – Create

PRESCRIBED TEXT BOOK
S.K. Singh, "Database Systems - Concepts, Design and Application", Pearson education,1stedition, 2013.

SUGGESTED REFERENCES

1. G.K.Gupta **,"Database Management System",** 2011, Tata McGraw Hill Publications CompanyLimited, New Delhi.
2. Seema kedar, **"Database Management System",** 2011, Technical Publications.
3. Elmasri & Navathe, **"Fundamentals of Database Systems"**, 2006, Pearson Education Publications, New Delhi.
4. P.K. Yadav,**"Database Management System"**, 2013, Tata McGraw Hill Publications CompanyLimited, New Delhi.
5. Jiawei Hen and Micheline Kamber, **"Data Mining Concepts and Techniques"**, 2ndEdition, Morgan Kaufmann,2006.

Note: Learners are advised to use latest edition of books.

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCE
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – III

Course Title	MAJOR CORE - 8 - DATABASE MANAGEMENT SYSTEMS-LAB
Total Hours	60
Hours/Week	4
Code	U20CA3MCP08
Course Type	Practical
Credits	3
Marks	100

GENERAL OBJECTIVE

To examines the database architecture and data mining technologies required for solving complex problems of data and information management, information retrieval, and knowledge discovery facing modern organizations.

COURSE OBJECTIVES

To enable the learners:

Co No.	Course Objectives
CO-1	Understand to create table,aggregate functions,set operators using queries;
CO-2	Provide pratices to partition the table,usage of nested queries;
CO-3	Apply pl/sql program to prepare mark sheet,pay slip,electricity bill;
CO-4	Apply pl/sql program to prepare multiplication table,count the strings;
CO-5	Provide the exposure on weka tools;

1. Table creation and simple queries.

2. Queries using aggregatefunctions.

3. Queries using set Operators.

4. Table creation with various joins.

5. Partitioned table creation.

6. Nested sub queries and correlated sub queries.

7. View creation and manipulations.

8. PL/SQL program to prepare mark sheet.

9. PL/SQL program to prepare a payslip.

10. PL/SQL program to prepare the electricity Bill.

11. PL/SQL program to prepare the multiplication table for a given number.

12. PL/SQL program to count the number of characters and digits in a string.

13. Exposure on WEGAtools.

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002

SCHOOL OF MATHEMATICAL COMPUTATION SCIENCE
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – III

Course Title	MAJOR ELECTIVE -1 - EMERGING TRENDS IN IT
Total Hours	60
Hours/Week	4
Code	U20CA3MET01
Course Type	Theory
Credits	3
Marks	100

GENERAL OBJECTIVE
To understand the concepts of Emerging trends in Information Technology and Explore the current technology innovations to become informed on the latest technology issues

COURSE OBJECTIVES
To enable the learners:

CO No.	Course Objectives
CO-1	Understand the concepts of Cloud Computing Services, Layers and Models;
CO-2	Apply the concepts of Wireless sensor network;
CO-3	Analyze the different Stack layers of big data;
CO-4	Understand the Mobile security;
CO-5	Understand the differences between forward chaining and backward chaining.

CO – Course Objective

UNIT I   **12 Hrs**

CLOUD COMPUTING OVERVIEW: Layers and Types of Clouds- Desired features of a Cloud- Cloud Infrastructure Management – Infrastructure as a Service Providers – Platform as a Service Provider- Challenges and Risk. **MANAGING INTO A CLOUD:** Broad approaches to Migrating into a Cloud- Seven Step Model of Migration into a Cloud- Data security in the Cloud.
Extra Reading/Keywords: *Services on Cloud, characteristics and different kinds of Cloud.*

UNIT II   12 Hrs

IOT –Introduction to Internet of Things-Definition and Characteristics -IOT-Physical design of IOT - IOT Protocols, IOT Communication models, IOT communication of APIs- IOT enabled Technologies- Wireless Sensor Networks, Cloud Computing, Big data Analytics, Communication Protocols, Embedded Systems, Domain Specific IOTs, Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle- IOT and M2M – software defined networks, Network function Virtualization- SDN and NFV for IOT.

Extra Reading/Keywords: *Analytics, Sensor, Protocols.*

UNIT III   12 Hrs

GRASPING THE FUNDAMENTALS OF BIG DATA: The Evolution of Data Management – Understanding the Waves of Managing Data – Defining Big Data – Building a successful Big Data Management Architecture. **EXAMINING BIG DATA TYPES:** Defining Structured Data – Defining Unstructured Data: **DIGGING INTO BIG DATA TECHNOLOGY COMPONENTS:** Exploring the Big Data Stack – Layer 0: Redundant Physical Infrastructure – Layer 1: Security Infrastructure – Interfaces and Feeds to and from Applications and the Internet – Layer 2: Operational Databases – Layer 3: Organizing Data Services and Tools – Layer 4: Analytical Data Warehouses – Big Data Analytics – Big Data Applications.

Extra Reading/Keywords: *Digging, data types of BIG DATA, Layers.*

UNIT IV   12 Hrs

MOBILE COMPUTING: Introduction- Mobile Computing Devices- Mobile Computing functions-Wireless Technology- Evolution of Wireless Technology-Types of Wireless Technology- Fundamentals of Cellular System-Adhoc and Sensor Network- Data Delivery Mechanisms-**MOBILE AGENTS**-Characteristics of Mobile Agents-Mobile Agent Platforms – Mobile Agent Security.

Extra Reading/Keywords: *Mobile App, Web Development, XML, Jquery.*

UNIT V   12 Hrs

ARTIFICIAL INTELLIGENT: Introduction-Concept-Intelligence-Learning-Reasoning-Problem solving: Perception-Problem Solving approaches: State space Algorithm –Disciplines: subject-Learning Systems-Knowledge representation and Reasoning. **APPLICATIONS OF ARTIFICIAL INTELLIGENCE TECHNIQUES:** Expert System-Image understanding and Computer Vision- Speech and Natural Language – Scheduling – Intelligent Control.

Extra Reading/Keywords: *Intelligent Agent, Heuristics, Knowledge Representation.*

  Note: Texts given in the Extra reading /Keywords must be tested only through Assignment
  and Seminars.

COURSE OUTCOMES
The learners will be able to:

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Know the Layers and Models of Cloud computing;	PSO1	U
CO-2	Understand the different kinds of drivers in IOT;	PSO 2	An
CO-3	Apply Apriori algorithms and Find the Frequent Item sets;	PSO 2	Ap
CO-4	Understand the Applications of VPN Technologies;	PSO 5	An
CO-5	Understand the Concepts of Constraint Satisfaction, backtracking and unification.	PSO 1	Ap

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An– Analyse; E- Evaluate; C – Create.

PRESCRIBED TEXT BOOKS
1. Rajkumar Buyya, James Broberg, Andezej Goscinski, **"Cloud Computing Principles and Paradigms"**,WILEY Publications , 2013.
      Unit I Chapters – 1, 2, 23
2. Arshdeep Bahga, Vijay Madisetti, **"Internet of Things – A hands-on approach"**, Universities Press,2015.
      Unit II Chapter - 1
3. Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, "**Big Data for Dummies**", A Wiley Brand - Wiley Publications, 2013.
      Unit III: Chapters 1, 2 ,3, 4
4. Prashant Kumar Patra, Sanjith Kumar Dash, **"Mobile Computing",** Second Edition, SCITECHPublications, 2018.
      Unit IV: Chapter 1,18,22
5. S.K. Bansal, **"Artificial Intelligence".** APH Publishing Company, New Delhi, 2013.
      Unit V: Chapters 1

SUGGESTED REFERENCES

1. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
2. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.
3. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014.
4. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
5. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008

Note: Learners are advised to use latest edition of books.

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCE
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – III

Course Title	MAJOR ELECTIVE - 1 - BASIC CONCEPTS OF PROGRAMMING
Total Hours	60
Hours/Week	4
Code	U20CA3MET02
Course Type	Theory
Credits	3
Marks	100

GENERAL OBJECTIVE
To understand the basic concepts of programming and to develop programming skills using C and C++ languages.

COURSE OBJECTIVES
To enable the learners:

CO No.	Course Objectives
CO-1	Explain algorithm and flowchart symbols;
CO-2	Familiarize the concepts of Constants, Variables, Keywords and Data types;
CO-3	Discuss the various types of operators and statements such as Sequential, Conditional and Decision Making;
CO-4	Understand the Loop constructs, different types of arrays;
CO-5	Understand the basics of functions, procedures and file management.

CO – Course Objective

UNIT I   **12 Hrs**
Overview: Introduction to Computer Program - Introduction to Computer Programming - Uses of Computer Programs – Algorithm and Flowchart **– Programming Environment**: Text Editor - Compiler - Interpreter - Online Compilation; **Basic Syntax**: Hello World Program in C and C++ - Syntax Error
Extra Reading /Keywords: *Algorithms and Flowchart for real time applications*

UNIT II   **12 Hrs**
Constants, Variables and Data Types: Character Set **-** Constants - Creating variables - Store Values in Variables - Access Stored Values in Variables - Variables in C and C++**; Keywords**: C and C++ Programming Reserved Keywords
Extra Reading /Keywords: *Programs using I/O operations in C and C++*

UNIT III   **12 Hrs**
Operators: Arithmetic Operators - Relational Operators - Logical Operators - Operators in C and C++**; Sequential and Conditional Statements - Decision Making Statements**: Simple if - if...else statement else if ladder - The switch statement - Decisions in C and C++
Extra Reading /Keywords: *Additional Programs using Sequential and Control statements in C and C++*

UNIT IV   **12 Hrs**

Loops: The while Loop - The do...while Loop - The break statement - The continue statement – The for Statement – Jumps in Loops - Loops in C and C++**; Arrays**: Create Arrays – Declaration and Initialization of Arrays -Accessing Array Elements – One Dimensional and Two Dimensional Arrays - Arrays in C and C++ ; **Strings**: Basic String Concepts - Strings in C and C++

Extra Reading /Keywords: *Additional Programs using Arrays and Srtings in C and C++*

UNIT V   **12 Hrs**

Functions and Procedures: Defining a Function **-** Calling a Function **-** Defining and Calling a Procedure - Functions in C and C++ - Top-down and Bottom-up programming; **Files:** File Input/Output - File Operation Modes - Opening Files - Closing a File - Reading and Writing a File; **Simple Programs in C and C++**

Extra Reading /Keywords: *Additional Programs using Functions and File handling in C and C++*

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.

COURSE OUTCOMES
The learners will be able to:

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Explain algorithm and flowchart;	PSO1	U
CO2	Discuss the concepts of Constants, Variables, Keywords and Data types;	PSO1	U
CO-3	Classify the various types of operators and statements such as Sequential, Conditional and Decision Making;	PSO2	Ap
CO-4	Apply the concept of Loop constructs, different types of arrays for solving Simple problems;	PSO2	Ap
CO-5	Apply the concept of functions, procedures and file management for developing Simple Programs – Analyze the difference between C and C++ programs.	PSO3	An

 PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An– Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT BOOKS
1. E. Balagurusamy, "Programming in ANSI C", Seventh Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2017.

2. E. Balagurusamy, "Object-Oriented Programming with C++", 7th Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2017.

SUGGESTED REFERENCES

1. Deitel and Deitel, **"C How to Program"**, Seventh Edition, Pearson Education Pvt. Ltd., 2013.
2. R.G.Dromey, **"How to Solve it by Computer"**, Fifth Edition, Pearson Education Pvt. Ltd., New Delhi, 2007.
3. K R Venugopal ,Sudeep R Prasad, **"Mastering C"**, Second Edition, McGraw Hill Education Private Limited, 2015.
4. Dr R Rajaram , "Object Oriented Programming And C++ ",Second Edition , New Age International (P) Ltd., 2013.
5. Sourav Sahay , "Object Oriented Programming with C++", Oxford University Press, 2nd edition, 2012.

Note: Learners are advised to use latest edition of books.

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCE
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – III

Course Title	MAJOR SKILL BASED ELECTIVE (MSBE)-1 - FRONT OFFICE TOOLS-LAB
Total Hours	30
Hours/Week	2
Code	U20CA3SBP01
Course Type	Practical
Credits	1
Marks	100

GENERAL OBJECTIVE

To impart practical skills and knowledge on various application software used for office automation like MS-Word, MS-Excel and MS-PowerPoint for creating documents, data analysis, graphical representations and preparing presentations.

COURSE OBJECTIVES

To enable the learners:

CO No.	Course Objectives
CO-1	Understand to create a document, formatting the text, spell check and printing the document;
CO-2	Create a main and provide mass distribution of mails using Mail Merge and using tables to present textual and numerical data;
CO-3	Apply Formatting to Spreadsheet for organizing the data;
CO-4	Apply formulas in Spreadsheet and to analyze the data visually through graphical Representations;
CO-5	Apply text, graphics and multi-media effects to create professional presentations.

CO – Course Objective

LIST OF PRACTICAL EXERCISES
    MS-WORD:
    1. Create and save a document and perform the following:
        a. Insert an Image and a textbox
        b. Deletion of Character, Word, line and block of text
        c. Undo and redo process
        d. Moving, Copying and renaming
    2. Format the Text document using:
        a. Character formatting
        b. Paragraph formatting
        c. Page formatting

3. Spell check the document using:
    d. Finding and Replacing of text
    e. Bookmarks and Searching for a Bookmarks
    f. Checking Spelling and Grammar automatically
    g. Checking Spelling and Grammar using Dictionary

4. Print the document using:
    h. Print Preview
    i. Print Dialog box

5. Mail Merge in MS-WORD
    j. Create main document and data file for mail 15merging
    k. Merging the files
    l. From letters using mail merging
    m.Mailing labels using mail merging

6. Table creation in MS-WORD
    n. Create a table in the document
    o. Add row, column to a table
    p. Changing column width and row height.
    q. Merge, split cells of table.
    r. Use formulae in tables.
    s. sorting data in a table.
    t. formatting a table.

MS-EXCEL:
1. Create and save a new work book in Excel
    a. Entering Data into Worksheet
    b. Editing data of Worksheet
    c. Formatting the text in the cells
    d. Formatting the numbers in the cells
    e. Formatting cells.
    f. Copying format of cell along with data format.
    g. Changing the height and width of cells.
    h. Freezing Titles, splitting screen

2. Create a Student Worksheet with Reg. No., Name, Mark1, Mark2, Mark3, Mark4, Total, Average, Result and Class to perform the following:
    a. Inserting built-in function Total & Average in to the cells
    b. Copying the formula over a range of cells.
    c. Enter formulae for calculation of Result and Class in the cells.

3. Create an Employee Worksheet with Empno, Name, Department, Designation, Basic Pay, HRA, DA, CCA, Allowances, PF, Housing Loan, Deductions, Gross Pay, Net Pay
    a. Use the formulas for calculating the Allowances, Deductions, Gross Pay, Net Pay
    b. Create graphs for the data using Chart Wizard.
    c. Format graphs in Excel.
    d. Printing of worksheet

4. Create a Sales Data Worksheet and perform the following:
   a. Use Filters for displaying a particular information
   b. Use Pivot Tables
   c. Use Sorting
   d. Data Validation

MS-POWERPOINT:
1. Create and save a new presentation using MS Power Point
   - layout of opening screen in Power Point
   - the tool bars in MS Power Point
   - Choose Auto Layout for a new slide.
   - Insert text and pictures into a blank slide.
   - Insert new slides into the presentation.
   - Apply slide transition effects.
   - Slide show.
   - Set animation to text and pictures in a slide
   - Set the sounds, order and timing for animation

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – III

Course Title	NON MAJOR ELECTIVE -1- BASIC DRAWINGAND EDITING LAB
Total Hours	45
Hours/Week	3
Code	U20CA3NMP01
Course Type	Practical
Credits	3
Marks	100

GENERAL OBJECTIVE

   To impart practical skills and knowledge to create or edit graphics images such as illustrations, line-arts, charts, diagrams, logos and sophisticated web graphics.

COURSE OBJECTIVES

 To enable the learners:

CO No.	Course Objectives
CO-1	Demonstrate the techniques of photo editing;
CO-2	Apply the tools to convert photograph to SVG;
CO-3	Learn various tools to create a abstract line;
CO-4	Demonstrate the techniques for resize and crop images;
CO-5	Demonstrate how to Remove or repair unwanted image areas.

PRACTICAL EXERCISES

1. Simple letter Logos

2. Carved wood Effect

3. To change the Gradient Color

4. Create a cool abstract line

5. Wrap text into the shape of an object

6. Easy text offsets

7. Cutting outline in the text

8. Turn an Image into a Vector

9. Convert Photograph to SVG

10. To Crop An Image and Remove Background

HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI- 2
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLIACATIONS
Second Year - Semester – III

Course Title	R Programming Lab (B.Com. (CA))
Total Hours	60
Hours/Week	4
Code	U20CA3ALP04
Course Type	Practical
Credits	2
Marks	100

General Objectives:

To learn use the programming language "R Programming" and perform using variables, data types, strings,operators, vectors, lists, matrices, arrays, data frames, factors, graphics, and statistics

Course Objectives:

The Learner will be able to

CO No.	Course Objectives
CO-1	Demonstrate the programs using R.
CO-2	Apply variables, data types, strings, operators, arrays, and matrices.
CO-3	Learn various data frames, factors and frames.
CO-4	Demonstrate the techniques for graphics.
CO-5	Demonstrate how to plot, and draw the pie chart and bar chart.
CO-6	Design and develop creative applications using R.

Basics:

1. Write a R program to get the first 10 Fibonacci numbers.
2. Write a R program to get all prime numbers up to a given number.
3. Write a R program to print the numbers from 1 to 100 and print "Fizz" for multiples of 3, print "Buzz" formultiples of 5, and print "FizzBuzz" for multiples of both.
4. Write a R program to extract first 10 english letter in lower case and last 10 letters in upper case and extractletters between 22nd to 24th letters in upper case.
5. Write a R program to find the factors of a given number.
6. Write a R program to find the maximum and the minimum value of a given vector.
7. Write a R program to get the unique elements of a given string and unique numbers of vector.
8. Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3matrix where each column represents a vector. Print the content of the matrix.
9. Write a R program to create a list of random numbers in normal distribution and count occurrences of eachvalue.

Advanced:

1. Write a R program to create a list of elements using vectors, matrices and a functions. Print the content ofthe list.

2. Write a R program to draw an empty plot and an empty plot specify the axes limits of the graphic.

3. Write a R program to create a simple bar plot of five subjects marks.

4. Write a R program to create a Dataframes which contain details of 5 employees and display the details.

5. Write a R program to create a Data Frames which contain details of 5 employees and display summary ofthe data.

HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI- 2
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
B.Sc. Physics - Second Year - Semester – III

Course Title	Database Management Systems(PHYSICS)
Total Hours	60
Hours/Week	4 Hrs/Wk
Code	U20CA3ALT05
Course Type	Theory
Credits	2
Marks	100

GENERAL OBJECTIVE
To impart the fundamental aspects of database design, database languages, and implementation through PL/SQLProgramming.
Course Objectives:
The learner will be able to

CO No.	Course Objectives
CO-1	Understand, analyze the basics of database systems and its architecture.
CO-2	Apply Structured Query Language to access data from database.
CO-3	Identify different data models and relate E-R model with relation.
CO-4	Apply Normalization techniques to refine database.
CO-5	Implement the Database Concepts through PL/SQL programming.

UNIT I : Introduction to DBMS   **12 Hrs**
Introduction to Database Systems: Basic Concepts and Definitions - Data Dictionary - Database - Database System - DataAdministrator - Database Administrator - Database System Architecture -- Data Independence – Mappings.
Extra reading/Key words*: DB Software, Big Data*

UNIT II : Structured Query Language   **12Hrs**
Relational Query Languages: Query Language – Structured Query Language: Advantages and Disadvantages of SQL- Basic SQL Data Structure - SQL Data Types - SQL Operators - Data Definition Language - Data Query Language - DataManipulation Language - Data Control Language - Data Administration Statements - Transaction Control Statements.
Extra reading/Key words*: Trigger, Views, PostgreSQL, Embedded SQL*

UNIT III : Types of Data Model   **12 Hrs**
Data Models: Record-Based Data Model-Object-Based Data Model-Physical Data Model-Hierarchical Data Model-Network Data Model- Relational Data Model-Object-Oriented Data Model-Comparisons between Data Model-Entity-Relational Model: Basic E-R Concepts – Conversion of E-R Model into Relations.
Extra reading/Key words : *EER Model, Advanced Data Analysis*

UNIT- IV Normalization   **12Hrs**
Introduction – Normalization - Normal Forms - BCNF – Multi-value Dependencies and 4NF – Join Dependencies and 5NF- Query Processing: Introduction – Query Processing – Syntax Analyzer – Query Decomposition.
Extra reading/Key words*: 6NF, ONF*

UNIT – V: Procedural Language   **12 Hrs**
Procedural Language- SQL: PL/SQL Block Structure – PL/SQL Tables. Cursor Management and Advanced PL/SQL: Opening and Closing a Cursor – Processing Explicit Cursor – Implicit Cursor – Exception Handlers – Sub Programs in PL/SQL– Functions – Precaution While Using PL/SQL Functions – Stored Procedure.
Extra reading/Key words*: Report Generation, Object Oriented Technology*

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.
Course Outcomes:
The learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recall and Relate file management systems with DBMS.	PSO 1	R, U
CO-2	Design relations using Database Schema	PSO 2 PSO 5	A
CO-3	Relate Relational Algebra Notation with Relation Operation to access the data.	PSO 2	An
CO-4	Differentiate and Refine the relations by applying normalization techniques.	PSO 4	An,E
CO-5	Sketch and Relate E-R diagrams with relations.	PSO 2	An
CO-6	Apply SQL queries to access the data.	PSO 4	Ap
CO-7	Implement the concepts of Database Systems through PL/SQL	PSO 1	U, Ap
CO-8	Programming using PL/SQL	PSO 2	Ap

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand;Ap – Apply; An – Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT BOOKS
1. S.K. Singh, "**Database Systems - Concepts, Design and Application**", Pearson Education, 1st edition, 2013.
2. Rajesh Narang, "**Database Management Systems**", PHI Learning PrivateLimited, New Delhi, Sixth Printing,2010.

BOOKS FOR REFERENCE
1. G.K.Gupta**, "Database Management System",** 2011, Tata McGraw Hill Publications Company Limited,New Delhi.

2. Seemakedar, **"Database Management System",** 2011, Technical Publications.

3. Elmasri&Navathe, **"Fundamentals of Database Systems"**, 2006, Pearson Education Publications, NewDelhi.

4. P.K. Yadav, **"Database Management System"**, 2013, Tata McGraw Hill Publications Company Limited,New Delhi.

5. Steven Feuerstein, Bill Pribyl, **"Oracle PL/SQL Programming"**, 2009, 5th Edition, O'Reilly Media Publications, United States of America.

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – IV

Course Title	MAJOR CORE - 9 - JAVA PROGRAMMING
Total Hours	60
Hours/Week	4
Code	U20CA4MCT09
Course Type	Theory
Credits	4
Marks	100

GENERAL OBJECTIVE
To enable the students to learn the syntax, concepts of the language and to write the solution for read world problems.

COURSE OBJECTIVES
To enable the learners:

CO No.	Course Objectives
CO-1	Understand & Analyze the Java features and Program Structure;
CO-2	Apply the concepts of encapsulation in terms of classes and objects;
CO-3	Understand and implement the types of Inheritance & Package;
CO-4	Differentiate and demonstrate the types in Thread creation and Exception Handling;
CO-5	Create the Applet Programming and apply the Collection Framework.

CO – Course Objective

UNIT I   **12Hrs**
JAVA EVOLUTION : Java History – Java Features – How Java Differs from C and C++ -- Java and Internet – Java and World Wide Web – Web Browsers – Hardware and Software Requirements – Java Support Systems – Java Environment.
OVERVIEW OF JAVA LANGAGE : Introduction – Simple Java Program – More of Java – An Application with Two Classes – Java Program Structure – Java Tokens – Java Statements – Implementing a Java Program – Java Virtual Machine – Command Line Arguments – Programming Style - **TYPE CONVERSION IN EXPRESSION-DECISION MAKING AND BRANCHING :** Introduction – Decision Making with If Statement – Simple If Statement – The If ..Else Statement – Nesting of If. Else Statements – The Else If Ladder – The Switch Statement – The ? : Operator.
Extra Reading /Keywords: *Netbean, Eclipse*

UNIT II   **12Hrs**
DECISION MAKING AND LOOPING: Introduction – The While Statement – The do Statement– The for Statement – Jumps in Loops – Labeled Loops. **CLASSES, OBJECTS AND METHODS:** Introduction – Defining a Class – Fields Declaration – Methods Declaration – Creating Objects – Accessing Class Members – Constructors – Methods Overloading – Static Members – Nesting of Methods – Inheritance: Extending a Class – Overriding Methods – Final Variables and Methods – Final Classes – Finalizer Methods – Abstract Methods and Classes – Methods with Varargs – Visibility Control.
Extra Reading /Keywords: *Generalization, Specialization*

UNIT III: **12Hrs**
 INTERFACES: MULTIPLE INHERITANCE: Introduction – Defining Interfaces – Extending
Interfaces – Implementing Interfaces – Accessing Interface Variables.
PACKAGES : PUTTING CLASSES TOGETHER : Introduction – Java API Packages – UsingSystem
Packages – Naming Conventions – Creating Packages – Accessing a Package – Using a Package –
Adding a Class to a Package – Hiding Classes – Static Import.
Extra Reading /Keywords: *Proxy, JAR Files.*

UNIT IV: **12Hrs**
MULTITHREADED PROGRAMMING : Introduction – Creating Threads – Extending the Thread
Class – Stopping and Blocking a Thread – Life Cycle of a Thread – Using Thread Methods – Thread
Exceptions – Thread Priority – Synchronization – Implementing the 'Runnable' Interface- Inter thread
communication. **MANAGING ERRORS AND EXCEPTIONS :** Introduction – Types of Errors –
Exceptions – Syntax of Exception Handling Code – Multiple Catch Statements – Using Finally
Statement – Throwing Our Own Exceptions – Using Exceptions for Debugging.
Extra Reading /Keywords: *Deadlock, Synchronization*

UNIT V: **12Hrs**
APPLET PROGRAMMING : Introduction – How Applets Differ from Applications – Preparing to
Write Applets – Building Applet Code – Applet Life Cycle – Creating an Executable Applet – Designing
a Web Page – Applet Tag – Adding Applet to Html File – Running the Applet – More About Applet Tag
– Passing Parameters to Applets – Aligning the Display – More About Html Tags
– Displaying Numerical Values – Getting Input from the User-Event Handling-Introduction to AWT
package-Introduction to Swings-**JAVA COLLECTIONS:** Overview of Interfaces-Overview of Classes-
Overview of Algorithms.
Extra Reading /Keywords:HTML5, Servlet

**Note: Texts given in the Extra reading /Key words must be tested only through Assignment and
Seminars.**
COURSE OUTCOMES
 The learners will be able to:

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	State OOPS and Relate java syntax with c and C++;	PSO 3	R, U
CO-2	Categorize OOPS such as encapsulation, abstraction, polymorphism;	PSO 1	R
CO-3	Apply encapsulation concepts in developing the programs with classes and objects;	PSO 5	Ap
CO-4	Identify different types of inheritance and apply them for reusability of code;	PSO 2	Ap
CO-5	Construct the packages by arranging the classes with visibility control;	PSO 1	Ap
CO-6	Design program using different methods of thread creation and exception handling;	PSO 1	U
CO-7	Create Internet program using applets;	PSO 4	An
CO-8	Evaluate java collection with other implementation methods of data structure;	PSO 1	U,R
CO-9	Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem.	PSO 4	An

 PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand;

 Ap – Apply;An – Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT BOOK

Balagurusamy, **"Programming with JAVA"**, 6th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2019.

SUGGESTED REFERENCES

1. Herbert Schildt, **"Java The Complete Reference"**, 10th edition, Tata McGraw-Hill PublicationsPvt. Ltd., New Delhi, 2017.
2. Y.Daniel Liang, **"Introduction to Java Programming"**, 10th edition, Pearson Education Ltd ,2015.
3. David J.Eck, **"Programming :Introduction to programming using Java"**, 6th edition, Create space Publications,2014.
4. Joshua Bloch, **"Effective Java"**, 3rd edition, Addison Wesley Publications, 2018.
5. Kathy Sierra, Bert Bates, **"Head First Java",** 2nd edition, O'Reilly Publications, 2008.

Note: Learners are advised to use latest edition of books.

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – IV

Course Title	MAJOR CORE - 10 - JAVA PROGRAMMING-LAB
Total Hours	60
Hours/Week	4
Code	U20CA4MCP10
Course Type	Practical
Credits	3
Marks	100

GENERAL OBJECTIVE

To learn the knowledge of object-oriented paradigm in the Java programming language, the use of Java in a variety of technologies and on different platforms.

COURSE OBJECTIVES

To enable the learners:

CO No.	Course Objectives
CO-1	Design and implement programs in the Java programming language that make strong use of classes and object;
CO-2	Create a program to print formatted text to the console output and read/parse console input text using a Scanner object;
CO-3	Apply logical constructs for branching and loops as well as use iterator objects when appropriate;
CO-4	Create the polymorphism through use of super-classes and interfaces;
CO-5	Design and implement custom checked and unchecked exception types;
CO-6	Designing Enterprise based applications by encapsulating an application's business logic.

CO – Course Objective

1. SIMPLE PROGRAMS.

2. CONTROL STRUCTURES

3. CLASSES & OBJECTS AND METHODS

4. ARRAYS

5. INTERFACE

6. INHERITANCE

7. PACKAGES

8. MULTITHREADED PROGRAMMING

9. EXCEPTION HANDLING

10. APPLETS

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – IV

Course Title	MAJOR ELECTIVE - 2 - ETHICAL HACKING
Total Hours	60
Hours/Week	4
Code	U20CA4MET03
Course Type	Theory
Credits	3
Marks	100

GENERAL OBJECTIVE
To Provide the Basic Concepts in Information Technology and to introduce the methodologies of ethical hacking and security measures.

COURSE OBJECTIVES
To enable the learners:

CO. No.	Course Objectives
CO-1	Understand the basic concepts of Computer;
CO-2	Understand the usage of computer and Computer Security issues;
CO-3	Understand the Impacts of Hacking, the types of Hackers and the framework of ethical hacking for enhancing the security;
CO-4	Understand the Information Security Models and Architecture;
CO-5	Understand the Business Perspective and Preparing for a Controlled Attack.

CO – Course Objective

UNIT I   **12 Hrs**
Introduction to Computers - Classification of Digital Computer - Introduction to Computer Software - Programming Language – Operating Systems - Introduction to Database Management System.
Extra Reading/ Keywords: *Generation of computers, DDL, DML*

UNIT II   **12 Hrs**
Computer Networks - WWW and Internet – Email - Computers at Home, Education, Entertainment, Science, Medicine and Engineering - Introduction to Computer Security - Computer Viruses, Bombs, Worms.
Extra Reading/ Keywords: *Malware, Ransomware, Adware*

UNIT III   **12 Hrs**
INTRODUCTION: Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable and Integration.
Extra Reading/ Keywords: *Cyber Activism, Cyber Terrorism, Data Breaches*

UNIT IV   **12 Hrs**
INFORMATION SECURITY MODELS: Computer Security, Network Security, Service Security, Application Security, Information Security Program: The Process of Information Security, Security Programs, Risk Analysis and Ethical Hacking.
Extra Reading/ Keywords: *Hacktivism, Pandemic-related Attack.*

UNIT V   **12 Hrs**
THE BUSINESS PERSPECTIVE: Business Objectives, Security Policy, Previous Test Results, Business Challenges Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Multi-Phased Attacks: Types.
Extra Reading/ Keywords: *Firewall, Anti _Virus softwares*

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.
COURSE OUTCOMES
The learners will be able to:

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Know the basic concepts of computer;	PSO1, PSO2	U
CO-2	Know the usage of the computer in various fields and its network;	PSO 2	U
CO-3	Know different types of computer viruses and security issues;	PSO 2	U
CO-4	Gain the knowledge of the impact of hacking, hackers and the methodologies and framework of ethical hacking for enhancing the security;	PSO 5	An
CO-5	Gain the knowledge of the use and availability of tools to support an ethical hack;	PSO 1	Ap
CO-6	Gain the knowledge of interpreting the results of a controlled attack;	PSO2, PSO3	U
CO-7	Understand the role of politics, inherent and imposed limitations and metrics for planning of a test.	PSO 1, PSO5	An

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand;
Ap – Apply;An – Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT BOOKS
1. Fundamentals of Information Technology, Alexis Leon And Mathews Leon, Vikas Publishing House Pvt. Ltd, 2009
2. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press,2004.

SUGGESTED REFERENCES
1. Fundamentals of Computers and Information Technology, M.N Doja, 2005.
2. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning, Second Edition , 2016.
3. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking And Network Defense", Cengage Learning, 2010.
4. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010.
5. Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006.

Note: Learners are advised to use latest edition of books.

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – IV

Course Title	MAJOR ELECTIVE - 2 - WEB APPLICATION TECHNOLOGIES – PHP & MYSQL
Total Hours	60
Hours/Week	4
Code	U20CA4MET04
Course Type	Theory
Credits	3
Marks	100

GENERAL OBJECTIVE
To understand the concepts of PHP and MySQL to design and develop dynamic, database-driven
Web Applications.

COURSE OBJECTIVES
To enable the learners:

CO No.	Course Objectives
CO-1	Understand and recall the Building blocks and Flow control functions in PHP Script;
CO-2	Create PHP scripts that use the functions, arrays and relate the Object Oriented Programming Concepts;
CO-3	Write PHP scripts to relate the built-in-functions and elements of HTML forms;
CO-4	Demonstrate the cookies techniques to create and deploy the methods of files and Directories;
CO-5	Design and Develop database applications using MySQL.

CO – Course Objective

UNIT-I **12 Hrs**
Introduction: History of PHP. **The Building blocks of PHP**: Variables - Data Types - Changing type with settype() – Changing type with by casting - Operators and Expressions - Operator precedence - Constants - Predefined constants. **Flow Control Functions in PHP**: Switching Flow – Loops - Break statement – Continue statement - Nesting Loops - Code blocks and browser output.
Extra Reading /Keywords*: Create a simple web page using the various style sheet elements*

UNIT-II **12 Hrs**
Working with Functions: What is a Function – Calling functions - Defining a function - Returning Value from user-defined function. Variable Scope: Accessing variables with the Global statement - Saving state between function calls with the static statement. More about Arguments: Setting default values for arguments - Passing variable references to functions- Testing for the existence of a function. **Working with Arrays:** What are arrays - Creating Arrays - Creating associative arrays - Creating Multidimensional Arrays - Some array-Related Constructs and Functions. **Working with Objects:** Creating an object - Properties of object - Object methods – Constructors - Object Inheritance.
Extra Reading /Keywords:*Design a PHP script using Stored procedures*

UNIT-III 12 Hrs

Working with Strings, Dates and Time: Formatting String with PHP - Investigating String in PHP - Manipulating strings with PHP - Using date and time functions in PHP. **Working with Forms:** Creating a Simple Input Form - Accessing form input with user defined arrays - Combining HTML and PHP code on a single page. Working with file uploads: Creating the file upload form – Creating the file upload script.
Extra Reading /Keywords *: create the script using advanced built-in-functions*

UNIT-IV 12 Hrs

Working with Cookies and user Sessions: Introducing Cookies – The Anatomy of a Cookie - Accessing Cookie - Setting Cookies with PHP - Deleting a Cookie with PHP. Session Functions overview: Stating a Session - Working with Session Variables – Destroying Sessions and unsetting variables - Using Sessions in an Environment with registered users: Working with registered users - Working with user preferences.
Working with Files and Directories: Creating a function that performs multiple file tests - Creating and deleting files. Opening a file for Reading, Writing or appending - Locking files with flock(). Working with directories: Creating directories with mkdir() - Removing a directories with rmdir() - Opening a Directory for reading with opendir() - Reading the contents of a Directory with readdir().
Extra Reading /Keywords:*Email the submitted data using cookies and form elements*

UNIT-V 12 Hrs

MYSQL: Introduction to MYSQL: Introduction Database - Understanding an RDBMS - Understanding Tables,Record & Fields - SQL Language**. MySQL Function in PHP:** Database Connections - Managing Database – Connections - Performing Queries - Closing Connection. SQL Queries: Create Database & Table - Drop Database & Table - Insert Record - Select Record - Deleting Record - Modifying Record - WHERE Clause - Using Operators - Sorting Records - Eliminating Duplicates - Grouping Records, Having Clause - Joining Tables - Sub queries.
Extra Reading /Keywords: *Exporting and importing a database and tables with PHPMyAdmin*

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.

COURSE OUTCOMES
The learners will be able to:

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Explain the fundamental knowledge of basic concepts and interpret the use of PHP control flow statements in PHP programming;	PSO 1, 2	R, U
CO-2	Recognize and apply basic PHP code using Functions, Arrays and Objects;	PSO 2	R, Ap
CO-3	Identify and illustrate the String Operators and Date & Time Functions with basic HTML elements;	PSO 2, 5	R, Ap
CO-4	Interpret and working with the Cookies Files and Directories;	PSO 2, 5	R, An, Ap
CO-5	Analyze and interpret database SQL code for data storage and manipulation.	PSO 1, 2, 5	R, An, U, Ap

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand;

Ap – Apply;An – Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT BOOKS

1. Julie Meloni and Matt Telles, **SamsTeachYourself All in One PHP, MySQL® and Apache,** FifthEdition, 2012.
   UNIT I : Chapters 5, 6.
   UNIT II: Chapter 7, 8, 9.
   UNIT III: Chapters 10, 11.
   UNIT IV: Chapters 12, 13, 14.
2. Learning PHP, MySQL, books by ' O' riley Press
   UNIT V

SUGGESTED REFERENCES

1. Kevin Tatroe, Peter MacIntyre and RasmusLerdorf, **"Programming PHP"**, O'REILLYmedia,3rd edition, 2013.
2. Ivan Bayross & Sharanam Shah, **"PHP 5.1"**, Shroff Publishers and Distributors Pvt. Ltd,New Delhi, Second Edition 2006.
3. Mario Lurig, **" PHP Reference: Beginner to Intermediate PHP5"** , Originally published, April 2008.
4. Mercer Dave W., Allan Kent, Steven D. Nowicki, David Mercer, Dan Squier & WankyuChoi,**"
   Beginning PHP5**", Wiley Publishing Inc., New Delhi, 2004.
5. Steven Holzner, W. Jason Gilmore, **"Beginning PHP and MySQL 5: From Novice to Professional"**,Second Edition, A press publication, 2006.

Note: Learners are advised to use latest edition of books.

(For Candidates admitted from the academic year 2020-21 onwards)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
BCA
Second Year - Semester – IV

Course Title	NON MAJOR ELECTIVE -2 - DIGITAL ART LAB
Total Hours	45
Hours/Week	3
Code	U20CA4NMP02
Course Type	Practical
Credits	3
Marks	100

GENERAL OBJECTIVE

To learn the basic tools found in Krita application and perform concept arts, textures, comics and animations.

COURSE OBJECTIVES

To enable the learners:

The Learner will be able to

CO No.	Course Objectives
CO-1	Demonstrate the techniques of Krita;
CO-2	Create, Analyze and Evaluate visual art elements of line, shape, color and texture;
CO-3	Apply layer masks, filters and blending modes, share and save the images in various formats;
CO-4	Learn various brushes for color management;
CO-5	Apply vector tools for non-destructive editing of objects;
CO-6	Design and develop creative artworks using Krita.

CO – Course Objective

1. Creation of Multicolored Text.

2. Applying Blending Modes in an object.

3. Drawing and Painting Basic Face.

4. Placing border around text.

5. Creating Glow Effect in an object.

6. Creating an Icon.

7. Flying Car Effect.

8. Fire Effect.

9. Creating a Cartoon Cloud.

10. Creating Sunset Beach Scene.

11. Curved Text Animation

12. Bouncing Ball Animation.

HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.COM.CA - Second Year - Semester – IV

Course Title	RELATIONAL DATABASE MANAGEMENT SYSTEM
Total Hours	60
Hours/Week	4 Hrs/Wk
Code	U20CA4ALT06
Course Type	Theory
Credits	2
Marks	100

General Objective:
To impart the fundamental aspects of database design, database languages and database-system implementation.

Course Objectives:
The Learner will be able to

CO No.	Course Objectives
CO-1	Understand the basic concepts of database systems.
CO-2	Illustrate relational algebra notation to access data from database.
CO-3	Examine and apply normalization techniques to normalize a database.
CO-4	Write simple and complex queries using SQL commands.
CO-5	Apply the concepts of forms and reports to create forms and reports.

UNIT I: **12 Hrs**
INTRODUCTION : Database System Applications – Purpose of Database Systems – View of Data – Database Languages – Relational Databases – Database Design – Data Storage and Querying – Transaction Management – Database Architecture - Data Mining and Information Retrieval – Specialty Databases – Database Users and Administrators – History of Database Systems.
Extra Reading/Key Words: *DB Software, Data Mining*

UNIT II: **12 Hrs**
RELATIONAL MODEL: Structure of Relational Databases - Database Schema – Keys - Schema Diagrams - Relational Query Languages - Relational Operations.
Extra Reading/Key Words: *Tuple and Domain Calculus*

UNIT III:
DATABASE DESIGN   **12 Hrs**
NORMALIZATION: The Purpose of Normalization – How Normalization Supports Database Design – Data Redundancy and Update Anomalies – Functional Dependencies – The Process of Normalization – First Normal Form - Second Normal Form - Third Normal Form.
Extra Reading/Key Words: *4NF, 5 NF*

UNIT IV: 12 Hrs

INTRODUCTION TO SQL : Overview of the SQL Query – Language - SQL Data Definition - Basic Structure of SQL Queries - Additional Basic Operations - Set Operations - Null Values - Aggregate Functions - Nested Subqueries - Modification of the Database

Extra Reading/Key Words: PostgreSQL, Embedded SQL

UNIT V: 12 Hrs

FORMS: Working with Forms: Basic Concepts_ Application development in Form 5.0_ FORM Module_ Using FORMS Builder_ FORMS Wizards_ Creating a FORM_ Generating and Running a FORM.

REPORTS: Working with Reports: Features_ Basic concepts_ Creating a Report using Oracle Report Builder_ Defining a data module for a Report_ Specify the layout for the report_ Specify a runtime parameter form for report_ Using Oracle Reports interface_ Creating a default tabular report_ Creating Computed Columns_ Customizing Report Layout.

Extra Reading/Key Words: Creative Form Designing, Creative Report Designing

Course Outcomes:

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the basic concepts of Database systems, database languages such as DDL, DML, database architectures and database users.	PSO 1	U
CO-2	Analyze the structure of relational databases, database schema, keys, schema diagrams ,query languages and relational operations.	PSO 4	A
CO-3	Understand the Normal forms and apply the normal forms concept to the various applications.	PSO 1	U
CO-4	Understand the basic structure of SQL queries, nested subqueries and apply the queries for various applications.	PSO 4	A
CO-5	Understand the basic concepts of Forms and Reports and apply them for creating forms and reports for the given applications.	PSO 4	A

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

TEXT BOOKS
1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "**Database System Concepts**", 2010, Sixth Edition, McGraw-Hill Publications.(UNIT I, UNIT II, UNIT IV)
2. New Delhi.(UNIT III)
3. Ivan Bayross, " **Commercial Application Development Using Oracle Developer 2000**",BPB Publications, New Delhi. (UNIT V)

REFERENCE BOOKS
1. Ramez Elmasri, Shamkant B. Navathe, "**Fundamentals of Database Systems",** 2006, Addison Wesley Publishing Company
2. Seema kedar, "**Database Management System",** 2011, Technical Publications.
3. Elmasri & Navathe, "**Fundamentals of Database Systems**", 2006, Pearson Education Publications, New Delhi.
4. P.K. Yadav,"**Database Management System**", 2013, Tata McGraw Hill Publications Company Limited, New Delhi.
5. G.K.Gupta **,"Database Management System",** 2011, Tata McGraw Hill Publications Company Limited, New Delhi.

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.Sc. Physics - Second Year - Semester – IV

Course Title	ALLIED – 5 : PROGRAMMING IN C (PHYSICS)
Total Hours	60
Hours/Week	4 Hrs/Wk
Code	U20CA4ALT07
Course Type	Theory
Credits	2
Marks	100

GENERAL OBJECTIVE
To understand the concepts of problem solving approaches and to develop programming skills using C language.

COURSE OBJECTIVES
The learner will be able to

CO No.	Course Objectives
CO-1	Understand the concepts of algorithms and create flowcharts for a given problem.
CO-2	Apply the basic concepts of C in real-time applications.
CO-3	Analyze the control constructs, different types of arrays and apply the concepts for solving problems in real time.
CO-4	Understand the concepts of strings and user defined functions in C.
CO-5	Understand the basics of pointers, structures, unions and files in C.

UNIT I   **15 Hrs**
INTRODUCTION TO COMPUTER PROBLEM SOLVING
Introduction: Steps involved in Problem Solving Using Computers – Algorithms – Flow Charts – Pseudocode – Evolution of Programming Languages: Introduction – Classification of Programming Languages - Compiler – Interpreter, Loader and Linker.
Extra Reading / Key words: Develop Algorithms for real time applications.

UNIT II   **15 Hrs**
CONSTANTS, VARIABLES, AND DATA TYPES: Introduction – Character Set – C Tokens – Keywords and Identifiers – Constants – Variables – Data Types – Declaration of Storage Class.
OPERATORS AND EXPRESSIONS: Introduction - Arithmetic Operators - Relational Operators - Logical Operators - Assignment Operators - Increment and Decrement Operators- Conditional Operators - Bitwise Operators -   Special Operators - Arithmetic Expressions - Evaluation of Expressions - Precedence of Arithmetic Operators - Some Computational Problems.
Extra Reading / Key words: Operators in python.

UNIT III   **15Hrs**
MANAGING INPUT AND OUTPUT OPERATORS: Introduction - Formatted Input - Formatted Output.
DECISION MAKING AND BRANCHING: Introduction - Decision Making with if Statement - Simple if Statement- The if else Statement - Nesting of if...else Statements - The Else if Ladder -

Switch Statement - ?: Operator – Goto Statement.
Extra Reading / Key words: Develop programs using decision making and branching statement.

UNIT IV   **15 Hrs**
DECISION MAKING AND LOOPING: Introduction – The While Statement - The do Statement – The for Statement - Jumps in Loops.
ARRAYS: Introduction – One-dimensional Array – Two-dimensional Arrays - Initializing Two - dimensional Arrays – Multi-dimensional Arrays.
Extra Reading / Key words: Develop programs using arrays.

UNIT V   **15 Hrs**
HANDLING OF CHARACTER STRINGS : Introduction –Declaring and initializing string Variables - Arithmetic Operations on Characters - String- handling Functions - Table of Strings.
USER DEFINED FUNCTIONS: Introduction - Definition of Functions - Function Declaration - Category of functions - No Arguments and No Return Values - Argument but No Return Values - Arguments with Return Values – No Arguments but Returns a Value – Functions that Return Multiple Values – Recursion.
STRUCTURES,UNIONS,POINTERS AND FILES: Introduction to structures,unions,pointers and files.
Extra Reading / Key words: Develop programs using functions.

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.

COURSE OUTCOMES (CO):
The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Know the correct and efficient ways of solving problems.	PSO1, PSO2	U
CO-2	Write C program for simple applications	PSO 2	An
CO-3	Formulate algorithm for simple problems	PSO 2	U
CO-4	Analyze different data types and arrays	PSO 5	An
CO-5	Perform simple search and sort	PSO 1	Ap
CO-6	Understand memory management and write programs using structures and union for solving complex computational problem	PSO2, PSO3	U
CO-7	Create files and perform file operations using C	PSO 1, PSO5	R, An
CO-8	Use programming language to solve problems	PSO1, PSO5	E

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply;
An – Analyse; E- Evaluate; C – Create

PRESCRIBED TEXT BOOKS

1. M. T. Somashekara, "Problem Solving with C", PHI Learning Private Limited, 2009.
2. E. Balagurusamy, "Programming in ANSI C", Seventh Edition, McGraw Hill
Education (India) Private Limited, New Delhi, 2017.

BOOKS FOR REFERENCE
1.BrianW. Kernighan and Dennis M. Ritchie, **"**The C programming Language**"**, Prentice-Hall
Publishing Company, 2006.
2.Deitel and Deitel, **"**C How to Program**"**, Seventh Edition, Pearson Education Pvt. Ltd., 2013.
3.R.G.Dromey, **"**How to Solve it by Computer**"**, Fifth Edition, Pearson Education Pvt.
Ltd., New Delhi, 2007.
4.Kamthane, A.N., **"**Programming with ANSI and Turbo C**"**, Pearson Education Pvt.
Ltd., New Delhi,2006.
5.K R Venugopal ,Sudeep R Prasad, **"**Mastering C**"**, Second Edition, McGraw Hill
Education Private Limited, 2015.

HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OFMATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.Sc. Physics - Second Year - Semester – IV

Course Title	ALLIED – 6 : PROGRAMMING IN C LAB (PHYSICS)
Total Hours	60
Hours/Week	4 Hrs/Wk
Code	U20CA4ALP08
Course Type	Theory
Credits	2
Marks	100

Exercises:

1. To perform basic arithmetic operations.

2. Finding the factorial of a number.

3. Checking whether a given text is palindrome or not.

4. Checking whether a number is odd or even.

5. Finding the largest of three numbers.

6. Finding the largest and smallest element in an array.

7. To perform matrix multiplication.

8. To generate the Fibonacci series.

9. To prepare mark sheet using looping statement.

10. To prepare payroll using looping statement.

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – V

Course Title	Major Core -11 : Software Engineering Concepts
Total Hours	60
Hours/Week	4
Code	U20CA5MCT11
Course Type	Theory
Credits	4
Marks	100

GENERAL OBJECTIVE
To learn the software engineering concepts through analysis, design, implementation, testing and maintenance and to develop a good software.

COURSE OBJECTIVES

CO No.	Course Objectives
CO-1	Understand the basic concepts of software engineering and software development life cycle models.
CO-2	Comprehend the concepts of requirement analysis and specification and software design.
CO-3	Learn Function-oriented software design and Object Oriented software development and to draw various Diagrams using UML.
CO-4	Understand User interface design and various testing.
CO-5	Recognize Software Quality, Reliability Management, Software Maintenance and CASE tools.

UNIT I   **12 Hrs**
INTRODUCTION: Evolution: Engineering Discipline – Software Development Projects – Exploratory Style of Software Development -Emergence of Software Engineering – Changes in Software Development Practices – Computer Systems Engineering. **SOFTWARE LIFE CYCLE MODELS:** Basic Concepts - Waterfall Model and its Extensions- RAD Model– Spiral Model. **SOFTWARE PROJECT MANAGEMENT:** Responsibilities of a Software Project Manger – Project Planning – Metrics for Project Size Estimation – Project Estimation Techniques – COCOMO - A Heuristic Estimation Technique.
Extra Reading /Key words: Additional Process Models.

UNIT II   **12 Hrs**
REQUIREMENTS ANALYSIS AND SPECIFICATION: Requirements Gathering and Analysis – Software Requirements Specification (SRS) – Formal System Specification.
SOFTWARE DESIGN : Characteristics of a Good Software Design – Cohesion and Coupling Layered Arrangement – Approaches of Software Design.
Extra Reading /Key words: Other design techniques.

UNIT III **12 Hrs**

FUNCTION-ORIENTED SOFTWARE DESIGN : Overview of SA/SD Methodology – Structured Analysis – Developing the DFD model as a System – Structured Design - Detailed Design – Design Overview. **OBJECT MODELING USING UML**: Basic Object-Orientation Concepts - UML – UML Diagrams – Use Case Model – Class Diagrams – Interaction Diagrams – Activity Diagrams – State Chart Diagram. **OBJECT-ORIENTED SOFTWARE DEVELOPMENT**: Design Patterns – An OOAD Methodology: Unified Process, Overview of the OOAD Methodology, Domain Modelling, Identification of Entity Objects, Interaction Modelling.

Extra Reading /Key words: Other architectural designs.

UNIT IV **12 Hrs**

USER INTERFACE DESIGN: Characteristics of a User Interface – Basic Concepts – Types of User Interfaces – Component-Based GUI Development – User Interface Design Methodology. **CODING AND TESTING**: Coding – Code Review – Testing – Unit Testing – Black-Box Testing – White-Box Testing – Debugging – Program Analysis Tools – Integration Testing – System Testing.

Extra Reading/Key words: Latest User Interface designs and Testing Tools.

UNIT V **12 Hrs**

SOFTWARE RELIABILITY AND QUALITY MANAGEMENT: Software Reliability– Software Quality – Software Quality Management System – ISO 9000 – SEI Capability Maturity Model. **COMPUTER AIDED SOFTWARE ENGINEERING**: CASE Environment – CASE support in Software Life Cycle – Characteristics of CASE Tools – Second Generation CASE Tool – Architecture of a CASE Environment**. SOFTWARE MAINTENANCE**: Characteristics of Software Maintenance. **SOFTWARE REUSE**: Issues in any Reuse Program – Reuse Approach – Reuse at Organization Level.

Extra Reading/Key words: Software reviews, Formal technical reviews

Course Outcomes:
The Learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recall and compare the various Software Life Cycle Models and Project Estimation Techniques.	PSO 1	R, U
CO-2	Explain the Specifications of Requirements Analysis and Software design.	PSO 2	A
CO-3	Illustrate the concepts of Function-Oriented Software Design, Object Modeling Using UML.	PSO 2	U
CO-4	Explore User Interface Design and Coding And Testing.	PSO 3	Ap
CO-5	Acquire the knowledge of Software Maintenance And Software Reuse	PSO 4	An
CO-6	Acquire the knowledge of working principles in developing a good software.	PSO 2	A

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

TEXT BOOK:
1. Rajib Mall, Fundamentals of Software Engineering, Prentice Hall of India Private Limited, 4th Ed., 2014.

BOOKS FOR REFERENCE:
1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach, 8/e", McGraw Hill International, 8th Ed., 2019.
2. Ian Sommerville, "Software Engineering", Addition Wesely, 10th ed., Singapore, 2015.
3. K.K.Agarwal&Yogesh Singh, "Software Engineering", New Age Intl. Publishers, Revised Ed., 2007.
4. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", McGraw Hill International, 9th Ed., 2008.
5. Shari Lawrence Fleeger," Software Engineering: Theory and Practice", Pearson Education Asia, New Delhi, 2007.
6. Carlo Ghezzi, Mehdi Jazayeri and DimoMandrioli, "Fundamentals of Software Engineering", 2001, Prentice-Hall of India Private Ltd., New Delhi.

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OFMATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – V

Course Title	Major Core 12 – Cloud Computing
Total Hours	60
Hours/Week	4
Code	U20CA5MCT12
Course Type	Theory
Credits	4
Marks	100

GENERAL OBJECTIVES
To impart the knowledge of a series of current cloud computing technologies, including technologies for Infrastructure as a Service, Platform as a Service, and Software as a Service. To enable the students to learn the different layers of the cloud technologies, virtualization mechanisms, data security and scientific applications of cloud.

COURSE OBJECTIVES:
The Learner will be able to

CONo.	Course Objectives
CO-1	remember the deployment and service models
CO-2	understand the various technologies
CO-3	analyze virtualization mechanisms
CO-4	explain the various platforms of cloud in industry
CO-5	evaluate pricing models for cloud based services

UNIT I   **12 Hrs**
UNDERSTANDING CLOUD COMPUTING: Origins and Influences - Basic Concepts and Terminology - Goals and Benefits - Risks and Challenges.
FUNDAMENTAL CONCEPTS AND MODELS: Roles and Boundaries - Cloud Characteristics - Cloud Delivery Models - Cloud Deployment Models.
Extra Reading / Keywords: Real time applications.

UNIT II   **12 Hrs**
CLOUD-ENABLING TECHNOLOGY: Broadband Networks and Internet Architecture – Data Centre Technology – Virtualization Technology-Web Technology – Multitenant Technology – Service Technology.
FUNDAMENTAL CLOUD SECURITY: Basic Terms and concepts –threat agents – cloud Security Threats – Additional Considerations.
Extra Reading / Keywords: Current Technologies, Security Challenges.

UNIT III   **12 Hrs**
VIRTUAL MACHINES PROVISIONING AND MIGRATION SERVICES:
Introduction and Inspiration –Background and related work – Virtual Machines
visioning and Manageability – Virtual Machine Migration Services – Provisioning in the
Cloud Context.
Extra Reading / Keywords: Virtual Machine Migration in Action.

UNIT IV   **12 Hrs**
SECURE DISTRIBUTED DATA STORAGE IN CLOUD COMPUTING:
Introduction – Cloud Storage:From LANs To WANs – Technologies for Data Security in
Cloud Computing – Open Questions and Challenges.
Extra Reading /Keywords: Mongo DB, Cosmos DB

UNIT V   **12 Hrs**
CLOUD APPLICATIONS : Scientific Applications : Healthcare – Biology – Geoscience
– Business and Consumer Applications : CRM and ERP – Productivity – Social
Networking – Media Applications – Multiplayer Online Gaming.
Extra Reading/Keywords :Green Computing Concepts.

**Note: Texts given in the Extra reading /Key words must be tested only through
Assignment and Seminars.**

Course Outcomes
The Learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Discuss the fundamental concepts in cloud.	PSO 1	R, U
CO-2	Analyse the cloud enabling technologies.	PSO 4	U
CO-3	Knowand explain the Virtualization mechanisms.	PSO 4	U
CO-4	Comprehend the Cloud Data Security concepts.	PSO 2	R
CO-5	Know and distinguish the various applications Cloud.	PSO 2	An

**PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply;
An – Analyse; E- Evaluate; C – Create**

TEXT BOOKS
1.Thomas Erl, ZaighamMahmood, and Ricardo Puttini, **"Cloud Computing: Concepts,
Technology and Architecture"**, Prentice Hall, U.S.A., 2014.
                UNIT I   **:**   Chapters 3 & 4
                UNIT II   **:**   Chapters 5 & 6
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, **"Cloud Computing: Principles and
Paradigms",** John Wiley & Sons, U.S.A., 2014.
                UNIT III   **:**   Chapter 5 (5.1to 5.4, 5.6)
                UNIT IV   **:**   Chapter 8 (8.1 – 8.4)
3.   RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, "**Mastering Cloud Computing"**,
Elsevier Inc., 2017.
                UNIT V   **:**   Chapter 10

BOOKS FOR REFERENCE
1. Michael J.Kavis, **"Architecting the Cloud: Design Decisions for Cloud Computing ServiceModels (SaaS, PaaS, and IaaS)"**, John Wiley & Sons Inc., 2014.
2. Kailash Jayaswal,Jagannath Kallakurchi, Donald J. Houde, Deven Shah,**"Cloud Computing Black Book"**, Dreamtech Press, 2014.
3. Toby Velte,Anthony Velte,Robert Elsenpeter, **"Cloud Computing, A Practical Approach"**,McGraw Hill Education, 2017.
4. Judith Hurwitz, Daniel Kirsch, "Cloud Computing for Dummies", 2nd Edition, Wiley India Pvt. Ltd., 2020.
5. Sunilkumar Manvi, Gopal K. Shyam, **"Cloud Computing: Concepts and Technologies"**,CRC Press. 2021.

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SCHOOL OFMATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – V

Course Title	Major Core - 13 : Computer Networks
Total Hours	60
Hours/Week	4
Code	U20CA5MCT13
Course Type	Theory
Credits	4
Marks	100

General Objectives:
To impart deep knowledge on different layers of Computer Networks and to know about the various network communications.

Course Objectives:
The Learner will be able to

CO No.	Course Objectives
CO-1	remembers and understands the basic organizations and protocols standards
CO-2	understand the types of Transmission Media and remembers the data link control
CO-3	understand the general techniques of Error control, Flow control in Data Link Protocols.
CO-4	analyse the Routing Algorithms in Network Layer; remember the underlying protocol in Transport Layer.
CO-5	remember the various services of Application Layer; analyze the various techniques in cryptography.

UNIT I 12 Hrs
OVERVIEW: Data Communications **-** Networks - Protocol and Standards. *Network Models*: Layered tasks - OSI Model - TCP / IP Protocol Suite - Addressing.
Extra Reading/Keywords: IoT interoperation across the OSI model.

UNIT II 12 Hrs
PHYSICAL LAYER AND MEDIA: Transmission Impairment – Performance. *Transmission Media*: Guided Media – Unguided Media. *Data Link Layer***:**Types of Errors – Redundancy – Detection versus Correction – Block Coding. *Data Link Control*: Framing – Flow and Error Control – Protocols.
Extra Reading/Keywords: Mobile Telephone System.

UNIT III 12 Hrs
NETWORK LAYER: IPv4 Addresses - IPv6 Addresses - Unicast Routing Precools – Multicast Routing Protocols.
Extra Reading/Keywords: Internet Routing Protocols

UNIT IV   **12 Hrs**
TRANSPORT LAYER: Process-to-Process Delivery – User Datagram Protocol - TCP - Congestion - Congestion Control and Quality of Service: Congestion Control - Quality of Service.
Extra Reading/Keywords: Quality of Service (QoS)

UNIT V   **12 Hrs**
APPLICATION LAYER: *Domain Name System*: Name space - Domain Name Space - Electronic Mail - File Transfer. *Cryptography*: Introduction - Symmetric key cryptography - Asymmetric key cryptography.
Extra Reading/Keywords: Communication Security and Web Security

Course Outcomes:
The Learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Explain the fundamental knowledge in different network layer models	PSO 2	R, U
CO-2	Describe about the types of Transmission Media and understands the data link controls	PSO 2,6	R, An
CO-3	Relate and illustrate the techniques of Error Detection and Correction, IPv4 Addresses and IPv6 Addresses.	PSO 2	U, A
CO-4	Express the Elementary Data Link Protocols.	PSO 3	R
CO-5	Illustrate and analyse the Routing Algorithms in Network Layer; explain the functions of Transport Layer.	PSO 4	R, An
CO-6	Identify the functionality of Application Layer services.	PSO 4	U
CO-7	Analyze and interpret the network security Techniques	PSO 1,6	R, An

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

TEXT BOOKS
1. Behrouz A. Forouzan, "Data Communications and Networking", Tata McGraw Hill Publications, 4th Ed., New Delhi, 2015.

BOOKS FOR REFERENCE
1. Black Uyless D., **"Data Communication and Distributed Networks"**, 2000, Prentice Hall of India Pvt. Ltd., New Delhi.
2. ForouzanBehrouz A., **"Local Area Networks"**, 2003, Tata McGraw Hill Publishing Limited, New Delhi.
3. GodboleAchyut S., **"Data Communication and Networks"**, 2002, Tata McGraw Hill Publishing Limited, New Delhi.
4. Mansfield Kenneth C., Antonakos James L., **"An Introduction to Computer Networking"**, 2002, Prentice Hall of India, New Delhi.
5. Tanenbaum Andrew S., **"Computer Networks"**, 2003, Pearson Education, Asia.

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002

SCHOOL OFMATHEMATICAL COMPUTATION SCIENCES

PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – V

Course Title	Major Core 14 - Object-Oriented Programming Using C# and .Net - Lab
Total Hours	60
Hours/Week	4
Code	U20CA5MCP14
Course Type	Practical
Credits	4
Marks	100

GENERAL OBJECTIVE:
Learn the web based technologies of the .NET framework and know the object oriented aspects of C#

COURSE OBJECTIVES:
The Learner will be able to

CO No.	Course Objectives
CO-1	Depict the various programming structures with relevant OOP in C#
CO-2	Demonstrate the OOPs concepts with C# programs
CO-3	Explain &depict the Windows application development in .NET with C# Programming
CO-4	Apply and analyze the applications with back end connectivity through ADO.NET structures
CO-5	Develop C# application programs with components related with database objects through ADO.NET connectivity

EXERCISES IN C#:

Console Applications

1. Simple Computations

2. Mark sheet Preparation

3. Telephone Bill Generation

4. Payroll Creation

5. Super Market Bill Preparation

Windows Applications

1. Simple Calculator and Scientific Calculator

2. Student ID Card Registration

3. Timer Creation

4. Notepad Application

5. Creating Library Database

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SCHOOL OFMATHEMATICAL COMPUTATION SCIENCES

PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – V

Course Title	MAJOR CORE – 15 - GRAPH THEORY
Total Hours	60
Hours/Week	4
Code	U20CA5MCT15
Course type	Theory
Credits	3
Marks	100

GENERAL OBJECTIVE

To enable the students to be familiar with the fundamental concepts of graph theory as anapplication of mathematics in information technology related fields.

COURSE OBJECTIVES
The learner will be able to

CO No.	Course Objectives
CO – 1	Understand the concept of graphs and sub graphs and operations on graphs
CO – 2	Understand the degree sequence and connectedness on graphs.
CO – 3	Understand about Eulerian, Hamiltonian graphs
CO – 4	Understand t he concept of trees, colouring and chromatic polynomial of graphs.
CO – 5	Apply graph theory concept on Connector Problems, Shortest Path Problem.

UNIT I: GRAPHS AND SUBGRAPHS   **12 Hrs**
Introduction – Definition and Examples - Degrees – Sub graphs – Isomorphism – Matrices – Operations on graphs.
***Extra Reading/Keywords**: Ramsey numbers, Subdivision of Graphs.*

UNIT II: DEGREE SEQUENCE AND CONNECTEDNESS   **12 Hrs**
Introduction – Degree Sequences – Graphic Sequences; Introduction – Walks, Trails and Paths – Connectedness and Components.
***Extra Reading/Keywords**: Menger's theorem, Moon's theorem*

UNIT III: EULERIAN, HAMILTONIAN GRAPHS   **12 Hrs**
Introduction – Eulerian Graphs – Hamiltonian Graphs;
***Extra Reading/Keywords**: The Chinese postman problem.*

UNIT IV: TREES AND COLOURABILITY   12 Hrs

Introduction–Characteristics of Trees– Centre of a Tree -Introduction - Chromatic number – chromatic polynomials.

Extra Reading/Keywords : *Mapping Problem*

UNIT V: APPLICATIONS OF GRAPH THEORY   12 Hrs

Introduction –Connector Problem –Shortest Path Problem –Transformation and kinematic Graph – Designing One Way Traffic System – Applications - The travelling salesman problem – Job Sequencing Problem.

Extra Reading/Keywords : *Prims algorithm*

Note: Texts given in the Extra Reading /Key Word: must be tested only through assignment and seminar.

COURSE OUTCOMES (CO)

The learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO – 1	Recall and relate graphs and sub graphs with their Properties	**PSO - 4**	**R,U**
CO – 2	Recognize the degree sequence and connectedness	**PSO - 5**	U
CO – 3	Relate Eulerian, Hamiltonian graphs	**PSO - 2**	U
CO – 4	Defines Trees, colouring of graphs and chromatic Polynomials.	**PSO - 3**	U
CO – 5	Apply graph theory to Connector Problem, Shortest Path Problem, Transformation and Kinematic Graph	**PSO - 1**	**U, Ap**
CO – 6	Understand the concepts of graph theory as an application of mathematics in information technology related fields-Skill Development	**PSO - 2**	**U,Ap**

PSO – Programme Specific Outcome; CO – Course Outcome; R- Remember; U-Understand; Ap – Apply; An – Analyse; E-Evaluate; C – Create

TEXT BOOKS

Treatment as in Dr.S.Arumugam and Dr.S.Ramachandran, " Invitation to Graph Theory",(7[th]reprint 2006) Scitech Publications pvt ltd, India.

UNIT I: Chapter 2(omit section 2.5 , 2.7 & 2.9)

UNIT II: Chapters 3 and 4(omit section 4.3 & 4.4)

UNIT III: Chapters 5 and 6.

UNIT IV: Chapter 10(omit theorem 9.4 to 9.8 from section 9. 1 & section 9.2 and section 9.3)

UNIT V: Chapter 11

BOOKS FOR REFERENCE

1. Harary (10th reprint 2021), Graph Theory, Narosa Publishing House , New Delhi,

2.Narsingh Deo (2008) , Graph Theory with Applications to Engineering and ComputerScience Prentice Hall of India, New Delhi.

3.S.P.Rajagopalan, R.Sattanatham (Reprint 2015), Graph Theory, Margham Publications, Chennai.

4.S.K.Yadav (2010), Elements of Graph Theory, Ane Books Private Limited, New Delhi.

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.Com.CA - Third Year - Semester – V

Course Title	Major Elective - 3 : Introduction to Python Programming
Total Hours	60
Hours/Week	4
Code	U20CA5MEP05
Course Type	Practical
Credits	3
Marks	100

General Objectives:
To provide comprehend basic Python programming concepts and develop programming solutions for small problems.
Course Objectives:
The Learner will be able to

CO No.	Course Objectives
CO-1	Learn the syntax and semantics of Python programming language; understand the necessity and importance of Lists, Dictionaries and Tuples
CO-2	Understand and relate the Functions and Modules to facilitate code reuse
CO-3	Express the different Decision Making and Looping statements
CO-4	Understand and study the Data visualization with different Charts
CO-5	Understand on Arrays and Matrices to perform a number of mathematical Operations

UNIT I   **12 Hrs**
The Python REPL: Introduction - Features of Python - Python as a Calculator – Variables - String Operations - Print Statements.
Data Types and Variables: Introduction - Numeric Data Types - Boolean Data Type – Strings – Lists - Dictionaries and Tuples.
Matrices and Arrays: Introduction - Installing NumPy – NumPy - Array Creation - ARRAY INDEXING - Array Slicing - Array Operations.
Extra Reading/Keywords: *Python Set types, Python Packages.*

UNIT II   **12 Hrs**
Functions and Modules: Introduction - Defining Functions in Python - Functions with Multiple Arguments - Functions with Default Arguments - Calling Functions from Other Files - Docstrings in Functions - Positional and Keyword Arguments
Control Structures: If Else Try Except – Introduction - User Input - If statements - Selection Statements - If Else Statements - Try-Except Statements – Flowcharts. *Loops*: Introduction – For Loops - While Loops - Break and Continue - Flowcharts Describing Loops.
Extra Reading/Keywords: *Boolean Operators.*

UNIT III   12 Hrs
Exercise programs: Input and Output operations - Operators - Arrays - Strings - Functions.
Extra Reading/Keywords: *System of Linear Equations*.

UNIT IV   12 Hrs
Exercise programs: Control structures & loops - Lists - Dictionaries and Tuples
Extra Reading/Keywords: *Boolean Operators.*

UNIT V   12 Hrs
Exercise programs: Data visualization with different Charts.
Extra Reading/Keywords: *3D Surface Plots.*

List of Exercises
1. Input and Output operations
     Write a python program to add two numbers using Input and Output Functions
2. Operators
     Write a program to create a menu with the following options
     1. To Perform Addition 2. To Perform Subtraction
     3. To Perform Multiplication 4. To Perform Division
3. Functions and Modules
Accepts users input and perform the operation accordingly. Use functions with arguments.
     To check whether the given string is palindrome or not
     To find factorial of a given number using functions
     To double a given number and add two numbers using lambda()
     To display a particular month of a year using calendar module.
     To print all the months of given year
     To print date, time for today and now
     To print date, time using date and time functions
Python program which accepts the radius of a circle from user and computes the area
(use math module).
Python function that takes two lists and returns True if they are equal otherwise false
4. Lists
     Create a list and perform the following methods
     1) insert() 2) remove() 3) append() 4) len() 5) pop() 6) clear()
5. Dictionaries
     Create a dictionary and apply the following methods
     1) Print the dictionary items 2) access items 3) use get() 4)change values 5) use len()
6. Tuples
     Create a tuple and perform the following methods
     1) Add items 2) len() 3) check for item in tuple 4)Access items
7. Control structures & loops:
     To print a number is positive/negative using if-else
     To find largest number among three numbers
     To read a number and display corresponding day using if_elif_else
     To calculate discount based on input amount
8. Arrays
     Using a numpy module create an array and check the following:
     1. Type of array 2. Axes of array 3. Shape of array 4. Type of elements in array
     To concatenate the data frames with two different objects
     To read a csv file using pandas module and print the first and last five lines of a file.
9. Data visualization with different Charts
     Visualisation using Matplotlib
     To set background color and pic and draw a square and fill the color using turtle module

Course Outcomes:
The Learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Interpret the basic principles of Python programming language; to create and manipulate lists, tuples and dictionaries	PSO 2	R, U, Ap
CO-2	Implement programs using functions and strings.	PSO 2,6	R, U, Ap
CO-3	Develop Python programs with conditionals and loops.	PSO 2	U, Ap, An
CO-4	Illustrate and analyse the data visualization with different charts	PSO 3	U, Ap, An
CO-5	Illustrate and interpret the concepts of arrays and matrices to manipulate and perform mathematical operations	PSO 4	U, Ap

PO-Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

TEXT BOOKS
1. Peter D. Kazarinoff, "Problem Solving with Python 3.7 Edition" A beginner's guide to Python & open-source programming tools Paperback – Import, 15 September 2019.

BOOKS FOR REFERENCE
1 Sheetal Taneja, Naveen Kumar, **"**Python Programming A Modular Approach**",** Pearson, 2017.
2. Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015.
3. Ashok Namdec Kamthane, Ait Ashok Kamthane, "Problem Solving and Python Programming", McGraw Hill Education (India) Private Limited, Chennai.
4. Jeffrey Elkner, Chris Meyers Allen Downey, Learning with Python, Dreamtech Press, 2015
5. ReemaThareja, "Python Programming using problem solving approach", Oxford University press, 2017.

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.Sc.Bio-Technology - Third Year - Semester – V

Course Title	Fundamentals of Programming (BIO-TECHNOLOGY)
Code	**U20CA5MET06**
Course type	**Theory**
Semester	**V**
Hours/Week	**4**
Credits	**3**
Marks	**100**

GENERAL OBJECTIVE
To understand the principles and techniques involved in design and implementation of programming languages, Scripting language and Database.

COURSE OBJECTIVES
To enable the learners:

CO No.	Course Objectives
CO-1	To understand the evolution of programming languages;
CO-2	To Understand the concepts of algorithms and create flowcharts for a given problem;
CO-3	To Understand & analyze the C features and Program Structure;
CO-4	Acquire programming skills in scripting language;
CO-5	Apply Structured Query Language to access data from database.

UNIT I **12 Hrs**
COMPUTER FUNDAMENTALS: Computer Everywhere – History & Generations - Classification - Applications of Computers-Similarities and difference between Human and Computer-Components of computer system-Input devices – Output Devices.
Extra Reading /Key words*: Binary Codes.*

UNIT II **12 Hrs**
ALGORITHMS DESIGNS: –Algorithms – Flow Charts – Pseudocode – Evolution of Programming Languages: Introduction – Classification of Programming Languages - **INTRODUCTION TO C LANGUAGES**: Character set- Variables and Identifiers- Built-in Data Types-Variable Definition- Declaration- C Key Words-Rules for Naming Variables.
Extra Reading /Key words*: Develop Algorithms for real time applications.*

UNIT III   **12 Hrs**
Operators and Expressions: Arithmetic Operators-Relational Operator-Logical Operator-Assignment operator-Increment and Decrement operator-**Managing Input and Output Operations:** Reading and writing a character-**Decision making and branching:** simple if-If else-nested if-else statement-switch statement **–Decision making and looping:** while statement-do statement-For Statements.
Extra Reading /Key words*: Basic I/O and Control operations in C Language.*

UNIT IV   **12 Hrs**
INTRODUCTION TO SCRIPTING LANGUAGE: What is HTML - HTML Documents - Basic structure of an HTML document - Creating an HTML document - Mark up Tags - Heading-Paragraphs - Line Breaks - HTML Tags-Introduction to elements of HTML - Working with Text - Working with Lists, Tables and Frames - Working with Hyperlinks, Images.
Extra Reading /Key words*: SGML Concepts.*

UNIT V   **12 Hrs**
INTRODUCTION TO DATABASES AND TRANSACTIONS: What is database system, purpose of database system, view of data, relational databases, database architecture. **SQL & Basic commands:** SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, UPDATE,ALTER,MODIFY & Select –commands.
Extra Reading /Key words*: Navigational Database, Integrated Data Store (IDS).*

Note: Texts given in the Extra Reading /Key Words must be tested only through assignment and seminar

COURSE OUTCOMES
The Learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recognize the fundamental concepts of computer, algorithm designs, C language, Scripting language and databases.	PSO 2	R, U
CO-2	Interpret the different data types, operators, logics, algorithms and database transactions	PSO 2	R, U
CO-3	Identify and apply the best logics and formulate algorithms to solve real time applications	PSO 2,PSO 6	U, Ap, An
CO-4	Construct and develop the websites for medium and large real time applications for various domains	PSO 3	U, Ap, An
CO-5	Develop queries that provide optimized performance on database transactions	PSO 3	U, Ap, An

PO-Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

TEXT BOOKS

1. P.K Sinha &Priti Sinha, "Computer Fundamentals", BPB Publications..
2. M. T. Somashekara, "Problem Solving with C", PHI Learning Private Limited, 2009.
3. Kogent Learning Solutions Inc. "HTML 5 in simple steps",Dreamtech Press
4. Abraham Silberschatz, "Database Systems - Concepts", McGraw Hill Publications Company Limited, New Delhi.

BOOKS FOR REFERENCES

1. A.B. Tucker, R.E. Noonan, "Programming Languages", TMH.
2. Steven M. Schafer "HTML, XHTML, and CSS Bible", Wiley India, 5th edition.
3. Anita Goel and Ajay Mittal, "Computer fundamentals and Programming in C", Pearson Education.
4. G.K.Gupta , "Database Management System", 2011, Tata McGraw Hill Publications Company Limited, New Delhi.
5. Seemakedar, "Database Management System", 2011, Technical Publication.

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SCHOOL OFMATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – V

Course Title	NON MAJOR ELECTIVE 3: DATA ANALYTICS USING R - LAB
Total Hours	45
Hours/Week	3
Code	U20CA5NMP03
Course Type	Practical
Credits	3
Marks	100

GENERAL OBJECTIVE
To discuss generic programming language concepts and Data Analytic through R

COURSE OBJECTIVES
The learner will be able to

CO NO.	COURSE OBJECTIVES
CO-1	Understand the basic concepts and techniques in R programming Language
CO-2	Understand the core concepts like importing data in various formats for statistical computing, data manipulation, Business Analytics and data visualization.
CO-3	Recognize and apply various functions, data structures, variables and flow of control.
CO-4	Understand how to use R for effective data analysis.
CO-5	Apply basic data analysis procedure on solving of data analytics problems.

EXERCISES:

Basic:
- Write a R program to get the first 10 Fibonacci numbers.
- Write a R program to get all prime numbers up to a given number.
- Write a R program to find the maximum and the minimum value of a given vector.
- Write a R program to get the unique elements of a given string and unique numbers of vector.
- Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.

Advanced:

- Write a R program to create a list of elements using vectors, matrices and a functions. Print the content of the list.
- Write a R program to draw an empty plot and an empty plot specify the axes limits of the graphic.
- Write a R program to create a simple bar plot of five subjects marks.
- Write a R program to create a Data Frames which contain details of 5 employees and display the details.
- Write a R program to create a Data Frames which contain details of 5 employees and display summary of the data.
- Reading iris datasets and perform data analysis.

Analytics :

1. DESCRIPTIVE STATISTICS IN R
a. Write an R script to find basic descriptive statistics using summary
b. Write an R script to find subset of dataset by using subset ()

2. READING AND WRITING DIFFERENT TYPES OF DATASETS
a. Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.
b. Reading Excel data sheet in R.
c. Reading XML dataset in R.

3. VISUALIZATIONS
a. Find the data distributions using box and scatter plot.
b. Find the outliers using plot. c. Plot the histogram, bar chart and pie chart on sample data

4. CORRELATION AND COVARIANCE
a. Find the correlation matrix.
b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.
c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data

5. REGRESSION MODEL
a. Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in an institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).

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SCHOOL OFMATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – V

Course Title	Major Skill Based Elective - 2: Multimedia - Lab
Total Hours	30
Hours/Week	2
Code	U20CA5SBP02
Course Type	Practical
Credits	1
Marks	100

GENERAL OBJECTIVE
To learn use the basic tools found in GIMP and perform tasks as photo retouching, image composition and image authoring.

COURSE OBJECTIVES
The learner will be able to

CO No.	Course Objectives
CO-1	Demonstrate the techniques of photo editing.
CO-2	Apply layer masks, filters and blending modes, share and save your images in various formats.
CO-3	Learn various retouching and repairing techniques to correct images.
CO-4	Demonstrate the techniques for resize and crop images.
CO-5	Demonstrate how to Remove or repair unwanted image areas.
CO-6	Design and develop creative applications using GIMP.

1. Creation of 3D Text effect with GIMP.

2. Placing an image inside text.

3. Reflection effect underneath a text.

4. Changing a color photo to pencil drawing.

5. Rainbow Effect.

6. Rain Effect.

7. Sunshine Effect.

8. Text Portrait Effect.

9. Displaying photos on a cube.

10. Sliced Text Effect.

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – VI

Course Title	Major Core 16 - Operating Systems
Total Hours	60
Hours/Week	4
Code	U20CA6MCT16
Course Type	Theory
Credits	4
Marks	100

GENERAL OBJECTIVE:
To enable the students learn the concepts of operating systems, CPU and disk scheduling, Memory management, paging, Demand paging, Page replacement algorithms and concluded with file system concepts.

COURSE OBJECTIVES:
The Learner will be able to

CO No.	Course Objectives
CO-1	Understand the structures of Computer system and operating systems.
CO-2	Remember the working process of thread and their types.
CO-3	Analyze the critical section problems and deadlocks.
CO-4	Understand the concept of memory management and virtual memory.
CO-5	Remember the file concepts and its types.

UNIT I   **12Hrs**
Operating System Overview: Operating system objectives and Functions-The evolution of Operating Systems - Developments leading to modern operating systems- Virtual Machines. Process Description and Control: Process-Process states-Process Description- process control.
Extra Reading /Key words: Discussing the work of process state.

UNIT II   **12Hrs**
Threads: Processes and Threads- Types of Threads. **Uniprocessor Scheduling:** Types of Processor scheduling-scheduling algorithms. Multiprocessor scheduling and Real Time scheduling: Multiprocessor scheduling.
Extra Reading /Key words: Comparison of thread types.

UNIT III   **12Hrs**

Concurrency: Mutual Exclusion and synchronization: Principles of concurrency- semaphores. Concurrency: Deadlock and starvation: Principles of deadlock- Deadlock Prevention - Deadlock avoidance – Deadlock detection **.**

Extra Reading/Key words: Discussing deadlock handling methods.

UNIT IV   **12Hrs**

Memory management: Memory management requirements – Memory partitioning –Paging- Segmentation. Virtual Memory: Hardware and Control Structure – Operating System Software.

Extra Reading /Key words: Compare the types of disk scheduling methods.

UNIT V   **12Hrs**

I/O management and disk scheduling: I/O devices - Organization of the I/O function - Operating system design issues –I/O buffering – Disk scheduling.

File Management: File organization and Access – File directories – File sharing –Record blocking –Secondary storage management.

Extra Reading/Key words: Discussing the different kinds threat

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminar.

Course Outcomes:
The Learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recall the different structures of operating systems.	PSO 1	R, U
CO-2	Discuss theory and implementation of processes, resource control, physical and virtual memory, scheduling, I/O and files	PSO 2	A
CO-3	Calculate waiting time, response time, turnaround time and disk seek time in disk scheduling	PSO 2	U
CO-4	Compare the memory allocation methods and differentiate the page replacement algorithms	PSO 3	Ap
CO-5	Summarize on memory organization.	PSO 4	An
CO-6	Conclude with a detailed understanding of Linux kernel	PSO 2	Ap

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand;
Ap – Apply;An – Analyse; E- Evaluate; C – Create

TEXT BOOK:

1. William Stallings, "Operating systems Internals and Design Principles", 2018, Ninth Edition, Prentice Hall Pearson Education,Inc.

> **UNIT I:** Chapter 1(1-2, 4-5)
> Chapter 2(1 – 4)
> **UNIT II:** Chapter 3(1-2)
> Chapter 8(1-2)
> Chapter 9 (1)
> **UNIT III:** Chapter 4(1, 3)
> Chapter 5(1-4)
> **UNIT IV:** Chapter 6(1-4)
> Chapter 7 (1-2)
> **UNIT V:** Chapters 10(1 - 5)
> Chapters 11(1-2, 4-7)

BOOKS FOR REFERENCE:

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 ompany Limited, New Delhi.
4. Tanenbaum Andrew S. & Woodhull Albert S., Operating Systems– Design Implementation, 2002, Pearson Education Publications, Singapore.
5. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts",2006, Sixth Edition, John Wiley & Sons Publications Inc., Singapore.

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – VI

Course Title	Major Core 17 – Computer Graphics
Total Hours	60
Hours/Week	4
Code	U20CA6MCT17
Course Type	Theory
Credits	3
Marks	100

GENERAL OBJECTIVE:
To introduce students with fundamental concepts and theory of Computer Graphics.

COURSE OBJECTIVES:
 The Learner will be able to

CO No.	Course Objectives
CO-1	Demonstrate the working principle of various video display devices such as CRT, LCD and LED systems and categorize the input and output devices used in graphics systems.
CO-2	Examine the specification of basic geometric structures such as Points, Lines, Circles & curves.
CO-3	Apply the various attributes that control the appearance of the displayed Primitives.
CO-4	Apply two dimensional transformations and clipping techniques in 2D scenes.
CO-5	Recognize the three dimensional display methods and compare parallel and perspective projections.

UNIT I   **12Hrs**
OVERVIEW OF GRAPHICS SYSTEMS: Video display devices: Refresh cathode-ray tubes - Raster-Scan Displays - Random-Scan Displays - Color CRT Monitors - Direct-View Storage Tubes - Flat-Panel Displays - Three-Dimensional Viewing Devices - Stereoscopic and Virtual-Reality Systems - Raster-Scan Systems: Video Controller - Raster-Scan Display Processor - Random-Scan Systems - Graphics Monitors and Workstations - Input Devices: Keyboards- Mouse - Trackball and space ball - Joysticks - Data Glove - Digitizers - Image Scanners - Touch Panels - Light Pens - Voice Systems- Hard Copy Devices.
Extra Reading/Keywords: CRT,LCD, LED.

UNIT II   **12 Hrs**
OUTPUT PRIMITIVES: Points and Lines - Line-Drawing Algorithms: DDA Algorithm-Bresenham's Line Algorithm - Loading the Frame Buffer - Line Function - Circle-Generating Algorithms: Properties of Circles - Midpoint Circle Algorithm - Curve Functions – Fill-Area Functions – Character Generation.
Extra Reading/Keywords: Ellipse Algorithm, Spline Curves.

UNIT III   12Hrs

ATTRIBUTES OF OUTPUT PRIMITIVES: Line Attributes: Line Type - Line width - Pen and Brush Options - Line color - Curve Attributes - Color and Grayscale Levels: Color Tables- Grayscale - Area-Fill Attributes: Fill Styles - Pattern Fill - Soft Fill - Character Attribute Text Attributes - Marker Attributes - Bundled Attributes: Bundled Line Attributes - Bundled Area-Fill Attributes - Bundled Text Attributes - Bundled Marker Attributes -Inquiry Functions.
Extra Reading/Keywords: Color table, Fill Styles.

UNIT IV   12Hrs

TWO - DIMENSIONAL GEOMETRIC TRANSFORMATIONS: Basic Transformations: Translation – Rotation – Scaling– Matrix Representations and Homogeneous Coordinates - Composite Transformations: Translations – Rotations -- Scaling. Other Transformations: Reflection -- Shear - Transformations between Coordinate systems - Affine Transformations - Transformation functions - Raster Methods for transformations.
TWO – DIMENSIONAL VIEWING: Window to View port Coordinate Transformations - Clipping Operations - Point Clipping - Line Clipping: Cohen Sutherland Line Clipping – Polygon Clipping: Sutherland-Hodgeman Polygon Clipping.
Extra Reading/Keywords: Shear, Window, Viewport.

UNIT V   12Hrs

THREE DIMENSIONAL CONCEPTS: Three - Dimensional Display Methods: Parallel projection -- Perspective Projection -- Depth Cueing -- Visible Line and Surface – Identification -- Surface Rendering -- Exploded and Cutaway Views -- Three-dimensional and Stereoscopic views -- Three-Dimensional Graphics Packages.
THREE – DIMENSIONAL VIEWING: Viewing Coordinates: Specifying the View Plane-- Transformation from World to Viewing Coordinates -- Projections: Parallel projection -- Perspective Projection.
Extra Reading/Keywords: Depth Cue, Convergence.

Course Outcomes:

The Learners

CO No.	COURSE OUTCOMES	PSOs Addressed	Cognitive Level
CO-1	Acquire the concept of Raster Scan & Random Scan System Architectures with relevant equations of computer graphics	PSO - 1	**R**
CO-2	Understood and analyze the basic graphics algorithms for drawing and clipping the geometric objects.	PSO - 2	**U**
CO-3	Able to recognize the coordinate elements to display graphic images to given specifications	PSO - 3	**R, U**
CO-4	Describes the standard graphic projections of lines, planes and solids	PSO - 4	**R, U**
CO-5	Obtain development of surfaces and filling attributes with geometric object with various projections	PSO - 5	**Ap, An**
CO-6	Classifies the 2D and 3D views and coordinate systems with graphical techniques	PSO - 5	**An, Ev**

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand;
Ap – Apply;An – Analyse; E- Evaluate; C – Create

TEXT BOOK

Donald Hearn &M.Pauline Baker **"Computer Graphics"** , 2015 ,Prentice Hall of India, New Delhi.

UNIT I   : Chapter-2 (2.1-2.6)
UNIT II   : Chapter-3 (3.1-3.5,3.9,3.12,3.14)
UNIT III   : Chapter-4 (4.1- 4.7)
UNIT IV   : Chapters 5(5.1 - 5.8), 6(6.3, 6.5-6.7,6.8)
UNIT V   : Chapters 9(9.1 – 9.2), 12(12.2 - 12.3)

BOOKS FOR REFERENCE

1. Asthana R.G.S , Sinha .N.K, **"Computer Graphics"**, 2002 , New Age International Publishers, New Delhi.
2. Foley, Van Dam, FeinerHugher,**"Computer Graphics – Principles & Practice"**, 2004, Pearson Education, New Delhi.
3. Krishnamurthy N.,**"Introduction to Computer Graphics"**, 2002, Tata McGraw Hill Publishing Company Limited, New Delhi.
4. David Hillman, **"Multimedia Technology and Applications"** ,2003,Galgotia Publications Private Ltd, New Delhi.
5. Judith Jeffcoale, **"Multimedia in Practice Technology and Applications"**, 2003, Prentice Hall of India Private Ltd, New Delhi.

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – VI

Course Title	Major Core 18 – Internet of Things
Total Hours	60
Hours/Week	4
Code	U20CA6MCT18
Course Type	Theory
Credits	3
Marks	100

GENERAL OBJECTIVE:
To understand the Fundamentals, Architecture and Protocols of Internet of Things and its application in various domain.

COURSE OBJECTIVES:
The Learner will be able to

CO No.	Course Objectives
CO-1	Understand the Internet of computer and Internet of things.
CO-2	Identify the different types of sensors
CO-3	Understand and analyze the architecture in various IoT Layers
CO-4	Analyze various protocols and its usage in communication.
CO-5	Create Program to implement IoT applications

UNIT- I: Introduction to IoT   **12Hrs**
Introduction and Definition of Internet of Things – IoT growth – A Statistical View – Application Areas of IoT – Characteristics of IoT – Things in IoT – IoT Stack – Enabling Technologies – IoT Challenges – IoT Levels – Cyber Physical System versus IoT – Wireless Sensor Network versus IoT.
Extra Reading/Keywords: *Bio sensors, Nano sensors*

UNIT-II: Introduction to Sensors, Microcontrollers and their Interfacing   **12Hrs**
Introduction to Sensor Interfacing –Types of Sensors: MQ-02/05 – Gas Sensor Interfacing with NodeMCU / Arduino – Interfacing the Obstacle Sensor - Interfacing the Heartbeat Sensor - Interfacing the Ultrasonic Sound Sensor - Interfacing the Gyro Sensor - Interfacing the LDR Sensor - Interfacing the GPS – Interfacing the Colour Sensor - Interfacing the pH Sensor - Controlling Sensors through Webpages – Microcontrollers: A Quick Walkthrough – Advanced RISC Machine.
Extra Reading/Keywords: *5G technology, Ambient intelligence*

UNIT – III: Protocols for IoT& Cloud for IoT   **12Hrs**
Protocols for IoT - Messaging and Transport: Introduction – Messaging Protocols – XMPP and DDS Protocols – Transport Protocols. **Protocols for IoT - Addressing and Identification:** Introduction – Internet Protocol Version 4 (IPv4) - Internet Protocol

Version 6 (IPv6) – IPv6: A Quick Overview – Internet Protocol Version 5 (IPv5) – Uniform Resource Identifier (URI). **Cloud for IoT:** Introduction–IoT with Cloud – Challenges – Selection of Cloud Service Provider: An Overview – Introduction to Fog Computing – Cloud Computing: Security Aspects.

Extra Reading/Keywords: *Security and Context Aware architecture*

UNIT – IV: IoT Protocols   **12Hrs**

The BACNet Protocol – Modbus– Zigbee: Zigbee – Association – The Zigbee Network Layer – The Zigbee APS Layer – The Zigbee Device Object (ZDO) and the Zigbee Device Profile (ZDP) – Zigbee Security - The Zigbee Cluster Library (ZCL) – The Next Generation: IP-Based Protocols: 6LowPAN – RPL.

Extra Reading/Keywords: *Physical Web, mDNS*

UNIT – V: Applications of IoT   **12Hrs**

Smart Homes: Tomorrowland Today: Automating the Home – A Short History of Smart Homes – Smart Steps to a Smart Home – Simple Components for a Smart Home. Smarter Living with Smart Furniture – Smart Environment with Smart Lighting – Smarter Views with Smart Windows – Smart Heating and Cooling with Smart Thermostats – Smarter Protection with Smart Security Systems. Smart Clothing: Wearable Tech.

Extra Reading/Keywords: *Simulator-Proteus*

Course Outcomes:
The Learners

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recognize and describe the Internet of computer and Internet of Things	PSO 1	R, U
CO-2	Classify IoT architecture based on their applicability.	PSO 2	An
CO-3	Identify the different protocols used in different layer.	PSO 2	R
CO-4	Classify models in IoT Architecture and relate it with real time implementation	PSO 2, PSO 3	An
CO-5	Express the IoT application in various real time problems	PSO 4 PSO 5	Ap

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand;
Ap – Apply;An – Analyse; E- Evaluate; C – Create

TEXT BOOKS:
1. Shiram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, "Internet of Things – Wiley India Pvt. Ltd, 2020.
      UNIT I: CHAPTER 1
      UNIT II: CHAPTER 2
      UNIT III: CHAPTER 3,4,5
2. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley India Pvt. Ltd, 2012 (Reprint 2018)
      UNIT IV: CHAPTERS 3,5,7(7.1 – 7.8)
3. Michael Miller, "The Internet of Things: How Smart TVs,Smart Cars, Smart Homes and Smart Cities are changing the World", Pearson Education Services Pvt. Ltd, 2015.
      UNIT V: CHAPTERS 5,6

BOOKS FOR REFERENCE:

1.Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), Architecting the " Internet of Things", Springer, 2011.
2.Pethuru Raj and Anupama C. Raman, "The Internet of Things Enabling Technologies, Platforms and Use Cases", Taylor & Francis, CRC Press, 2017.
3.Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
4.OvidiuVermesan,PeterFriess, "Internet of Things-From Research and Innovation to Market deployment",Rivers publisher.
5.Adrian McEWen and Hakim Cassimally, "Designing the Internet of Things", John Wiely and Sons private Ltd, 2014.

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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – VI

Course Title	Major Core 19 – Big Data Analytics
Total Hours	60
Hours/Week	4
Code	U20CA6MCT19
Course Type	Theory
Credits	3
Marks	100

GENERAL OBJECTIVE:
To impart knowledge in Fundamental of Big Data Analytics and Map Reduce Fundamentals and to recognize the key concepts of Hadoop framework, Map Reduce with Hive and Pig.

COURSE OBJECTIVES:
The Learner will be able to

CO No.	Course Objectives
CO-1	Understand the fundamental concepts of Big data
CO-2	Analyze the usage and extraction techniques of NoSql,Hadoop,Yarn
CO-3	Specify the importance of MongoDb and Mapreduce
CO-4	Determine the basic features of Hive and Big
CO-5	Apply and analyze the analytical platform in R

UNIT I
INTRODUCTION TO BIG DATA AND ANALYTICS **12 Hrs**
Classification of Digital Data, Structured and Unstructured Data - Introduction to Big Data:
Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data -Why Big Data - Data Warehouse and Hadoop Environment Big Data Analytics: Classification of Analytics –- Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments - Basically Available Soft State Eventual Consistency - Top Analytics Tools.
Extra Reading/Keywords: *Big data & Importance, examples of Real and non-real time requirements*

UNIT II
INTRODUCTION TO TECHNOLOGY LANDSCAPE **12 Hrs**
NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem.
Extra Reading/Keywords: *Importance of Distributed system in Big Data and its components*

UNIT III
INTRODUCTION TO MONGODB AND MAPREDUCE PROGRAMMING **12 Hrs**
MONGO DB: Why Mongo DB - Terms used in RDBMS and Mongo DB - Data Types –

MongoDB QueryLanguage MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.
Extra Reading/Keywords: *Usage of cloud for Big Data Cloud Market*

UNIT IV
INTRODUCTION TO HIVE AND PIG 　　　　　　　　　　　　　　**12 Hrs**
Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements –Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having. Pig: Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types.
Extra Reading/Keywords: *Analyzing the examples of Big Data Operational Databases with Apps.*

UNIT V
INTRODUCTION TO DATA ANALYTICS WITH R 　　　　　　　　　　**12 Hrs**
Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Machine Learning Algorithms: Regression Model, Clustering, Collaborative Filtering, Association Rule Making, Decision Tree.
Extra Reading/Keywords: *Future enhancements of Big Data Analytics*

 Course Outcomes:
 The Learners

CO No.	COURSE OUTCOMES	PSOs Addressed	Cognitive Level
CO-1	Explains the fundamentals of Big Data and categorizes Big Data and its importance	PSO – 1	R
CO-2	Identifies the classification of Analytics with Top analytical tool	PSO – 2	U
CO-3	Describes the MongoDp Query language with Mapreduce	PSO – 3	R, U
CO-4	Explore the various datatype and features in Hadoop & MapReduce	PSO – 4	R, U
CO-5	Summarizes the data analytics in various environments using Machine Learning techniques	PSO – 5	Ap, An
CO-6	Integrates the data analytics with Customized approaches using R program	PSO – 5	Ap, An

 PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

TEXT BOOK:
1. Seema Acharya, SubhashiniChellappan, "Big Data and Analytics", Wiley Publications, First Edition,2019

REFERENCE BOOK:
1. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big data for dummies", John Wiley & Sons, Inc. (2013)
2. Tom White, "Hadoop The Definitive Guide", O'Reilly Publications, Fourth Edition, 2015
3. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, "Hadoop For Dummies",Wiley Publications, 2014
4. Robert D.Schneider, "Hadoop For Dummies", John Wiley & Sons, Inc. (2012)
5. Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data,McGraw Hill, 2012 Chuck Lam, "Hadoop In Action", Dreamtech Publications, 2010

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CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – VI

Course Title	Major Core 20 – Information and Cyber Security
Total Hours	60
Hours/Week	4
Code	U20CA6MCT20
Course Type	Theory
Credits	4
Marks	100

GENERAL OBJECTIVE:
To gain in-depth knowledge in the field of Computer forensics- Cyber Crime & Cyber Laws

COURSE OBJECTIVES:
The enable the learners:

CO NO.	COURSE OBJECTIVES
CO-1	Understand the basics of Cyber Security.
CO-2	Identify the domain of cyber security policy.
CO-3	Analyze cyber security frameworks and security policy.
CO-4	Apply security principles and develop control system.
CO-5	Apply cyber security protection methods in real time applications.

UNIT I 12 Hrs
INFORMATION SECURITY OVERVIEW : The Evolution of Information Security-To build a Security Program:Authority-Framework-Assessment-Planning-Action-Maintenance-Business Processes Vs Technical Controls. **RISK ANALYSIS** :Threat Definition : Threat Vectors-Threat Sources and Targets-Types of Attacks :Malicious mobile code-APTs-Manual Attacks-Risk Analysis.
Extra Reading/Keywords: *Compliance with standards(NIST,ISO27002,COBIT)*

UNIT II 12 Hrs
AUTHENTICATION AND AUTHORIZATION : Authentication: Usernames and Passwords-Certificate –Based Authentication-EAP-Biometrics-Additional uses for Authentication. Authorization : User Rights-Role Based Authorization (RBAC)-Access Control Lists (ACLs)-Rule-Based Authorization. **ENCRYPTION** : Symmetric Key Cryptography-Public Key Cryptography. **DATABASE SECURITY** : Understanding Database Security Layers: Server-Level Security-Network-Level Security-Operating System Security. Understanding Database Level Security : Database Administration Security-Database Roles and Permissions.
Extra Reading/Keywords: *Database backups and recovery*

UNIT III 12 Hrs
INTRUSION DETECTION AND PREVENTION SYSTEMS : IDS Types and Detection Models :Host Based IDS-Network Based IDS(NIDS)-Anomaly-Detection(AD)Model-Signature –Detection Model.IDS Features: IDS End-User Interface -Intrusion-Prevention Systems(IPS). **DISASTER**

RECOVERY, BUSINESS CONTINUITY, BACKUPS AND HIGH AVAILABILITY : Disaster Recovery-Business Continuity Planning-Backups.
 Extra Reading/Keywords: *Security Information and Event Management (SIEM)*

UNIT IV   **12 Hrs**
INTRODUCTION TO CYBERCRIME: Definition-Classification of Cybercrimes :E-Mail Spoofing-Spamming- Cyber defamation-Internet Time Theft-Salami Attack/Salami Techniques-Data Diddling-Web Jacking-Pornographic Offenses-E-Mail Bombing-Password Sniffing-Credit Card Frauds-Identity Theft. **CYBEROFFENSES:** Introduction-Categories of Cybercrime-Criminals Plan the Attacks-Reconnaissance-Passive Attacks-Active Attacks-Scanning and Scrutinizing Gathered Information-Attack. Cyber stalking : Types of Stalkers.
 Extra Reading/Keywords: *Cyber Crime : Legal and Indian Perspectives, Cyber Crime and Indian ITA2000*

UNIT V   **12 Hrs**
CYBERCRIME: MOBILE AND WIRELESS DEVICES: Introduction-Trends in Mobility-Attacks on Mobile Phones-Laptops. **UNDERSTANDING COMPUTER FORENSICS** : The need for Computer Forensics-Digital Forensics Life Cycle-Network Forensics. **CYBER SECURITY: ORGANIZATIONAL IMPLICATIONS** : Introduction-Cost of Cybercrimes and IPR Issues. Security and Privacy Implications**.**
 Extra Reading/Keywords: *Securing mobile devices, Disaster Recovery, Business Continuity, Backups and High Availability*

COURSE OUTCOMES:
The Learner will be able to :

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recall the basics of cyber security	PSO 1	R,U
CO-2	Differentiate various cyber security issues	PSO 2	An
CO-3	Differentiate various Evidence Recovery tools	PSO 2	An
CO-4	Recall various cyber crimes	PSO 1	R,U
CO-5	Find out the suitable cyber law for each cybercrime which is the requirement of IT sector	PSO 2	AP-An
CO-6	Apply suitable security methods to cybercrimes happened in IT sector	PSO 4	Ap
CO-7	Recall security tools to protect the data and software which is the main bone of IT sector	PSO 1	U,An
CO-8	Apply suitable security tools to protect the software and data privacy	PSO 4	Ap,An

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand;
Ap – Apply; An – Analyse; E- Evaluate; C – Create

TEXT BOOKS:

1.Mark Rhodes-Ousley "The Complete Reference –Information Security" McGraw Hill Education (India) Private Limited, Edition 2013.

2. Nina Godbole, Sunit Belapure – "Cyber Security" Wiley India Pvt.Ltd,2021.

BOOKS FOR REFERENCE:

1.Michael E Whitman and Herbert J Mattord, ―Principles of Information Security, Vikas Publishing House, New Delhi, 2021,7th edition.

2.Micki Krause, Harold F. Tipton, ― Handbook of Information Security Management, Vol 1-3 CRCPress LLC, 2004.

3.Stuart McClure, Joel Scrambray, George Kurtz, ―Hacking Exposed, Tata McGraw- Hill, 2003 Matt Bishop, ― Computer Security Art and Science, Pearson/PHI, 2002.

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CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – VI

Course Title	Major Elective 4 – Data Analytics Tools – Lab
Total Hours	60
Hours/Week	4
Code	U20CA6MEP07
Course Type	Practical
Credits	3
Marks	100

GENERAL OBJECTIVE
To learn the software engineering concepts through analysis, design, implementation, testing and maintenance and to develop a good software.

COURSE OBJECTIVES
The Learner will be able to

CO No.	Course Objectives
CO-1	Understand the basic concepts of software engineering and software development life cycle models.
CO-2	Comprehend the concepts of requirement analysis and specification and software design.
CO-3	Learn Function-oriented software design and Object Oriented software development and to draw various Diagrams using UML.
CO-4	Understand User interface design and various testing.
CO-5	Recognize Software Quality, Reliability Management, Software Maintenance and CASE tools.

EXCERCISES

1. Functions
2. String processing
3. List processing
4. Dictionaries
5. Tuples
6. File processing
7. Regular Expressions
8. OOP
9. Retrieving WebPages from web
10. Data visualization in Matplotlib, Seabornand R
11. Database programming

12. Concurrent programming
13. Create dashboards and generate reports
14. Sharing Dashboards, reports and other apps in different ways
15. Get sample Datasets in Power BI
16. Apply themes in Power BI
17. Apply conditional table formatting in Power BI
18. Identify the ways to publish and share dashboards in Tableau
19. Organize workspaces in Tableau environment
20. Publish a Data Source on the web using Tableau

(For Candidates admitted in the academic year 2020-2021)
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CHOICE BASED CREDIT SYSTEM
B.C.A. - Third Year - Semester – VI

Course Title	Major Elective 4 –Software Testing – Lab
Total Hours	60
Hours/Week	4
Code	U20CA6MEP08
Course Type	Practical
Credits	3
Marks	100

GENERAL OBJECTIVE:
 Learn the different software testing tools and techniques

COURSE OBJECTIVES:
The Learner will be able to

CO No.	Course Objectives
CO-1	Describe the Automation Testing Approach.
CO-2	Describe test suites for software.
CO-3	Describe Selenium server and demonstrate it using a script in Java/PHP
CO-4	Describe a program to login a specific web page.
CO-5	Describe a program to get the number of list items in a list / combo box.

1. Install Selenium IDE; Develop a test suite containing minimum 4 test cases for different formats.

2. Perform a test suite for any two websites

3. Install Selenium Web Server and demonstrate it using a script in Java.

4. Develop and test a program to login a specific web page.

5. Develop and test a program to update 5 employee records into table into Excel file

6. Develop and test a program to select the number of students who have scored more than 75 inany one subject.

7. Develop and test a program to find out list of employees having salary greater than Rs. 25,000/- and age between 35 and 45 years.

8. Develop and test a program to provide total number of objects available on a web page.

9. Develop and test a program to get the number of list items in a list / combo box.

10. Develop and test a program to count the number of check boxes on a page checked and unchecked count.

11. Develop a test plan document for Library Management System.

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B.C.A. - Third Year - Semester – VI

Course Title	Non Major Elective 4 – Computer Awareness for Competitive Examinations
Total Hours	45
Hours/Week	3
Code	U20CA6NMT04
Course Type	Theory
Credits	3
Marks	100

GENERAL OBJECTIVE:
 To gain knowledge on the computer basics in the Competitive Examinations.

COURSE OBJECTIVES:
The enable the learners:

CO NO.	COURSE OBJECTIVES
CO-1	Understand the basics of Computer.
CO-2	Identify the various modes of communication.
CO-3	Analyze the different animation softwares used in graphics.
CO-4	Apply the programming languages in solving the problems.
CO-5	Recognize the applications of Internet in daily life.

UNIT- I   9 Hrs
 BASICSOFCOMPUTER:
Computer: Types & Generations of Computer – Hardware Memory – Peripherals.
 Extra Reading/Keywords: *Types of Memory*

UNIT–II   9Hrs
PROGRAMMING LANGUAGES:
Types of Languages – Machine Language – Assembly Language - Procedure Oriented
Languages – Object Oriented Language – Database Management Systems – Scripting
Languages.
Extra Reading/Keywords: *Comparison of languages*

UNIT–III   9 Hrs
ANIMATION: Computer Animation Morphing - Adobe Photoshop - Animation applied to
Modern Industry and Cinematography – Multimedia – Virtual Reality.
Extra Reading/Keywords: *Animation Softwares*

UNIT–IV   9 Hrs
INTERNET:
Networking Internet – World Wide Web – Hyperlink - IP Address – E-Mail – Cryptography
and Data Encryption.
 Extra Reading/ Keywords: *Protocols, Layers of Network*

UNIT – V   **9 Hrs**
COMMUNICATION&GENERAL:
Optical Data Storage & Communication – ISDN – Operating System – General.
Extra Reading/Keywords: *Recent Technology*

COURSE OUTCOMES:
The Learner will be able to :

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recall the basics of Computer and its types	PSO 1	R, U
CO-2	Differentiate various types of Networking for providing Data Communication	PSO 2	A
CO-3	Compare the various types of Languages and its purposes	PSO 2	U
CO-4	Apply the animations in the modern Industry	PSO 3	Ap
CO-5	Analyze the applications of internet and the Security Threats.	PSO 4	An

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand;
Ap – Apply; An – Analyse; E- Evaluate; C – Create

TEXT BOOKS:
1. Krishnakumar S, Addone Super Brain – A Key Hole Solution to Success in all Competitive Exams", Adonne Publishing Group Pvt. Ltd.2018.

BOOKS FOR REFERENCE:
1. Arihant, "Learn, Revise & Practice - Computer Awareness", Arihant Publications Pvt. Ltd,
2. Shika Agarwal, "Computer Knowledge for SBI/ IBPS Clerk/ PO/ RRB/ RBI/ SSC/ Railways/ Insurance Exams", 2nd Edition, 2017
3. Sowmiya Ranjan, "Computer Awareness for General Competitive Exams (Objective with Subjective)", B.K.Publications Pvt. Ltd., 2019
4. Sasmita Muduli, "Computer Awareness Book For All Competitive Exams. Subjective With Objective , 6000+ Mcqs With 50 Practice Sets", Salween Publications Pvt. Ltd, 2022
5. Dr. P. K. Pandey, "Computer Knowledge for Competitive Exams", Mahaveer Publications, 2019

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SCHOOLOFMATHEMATICALCOMPUTATIONSCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICEBASEDCREDITSYSTEM
B.Com.CA- Third Year - Semester – VI

Course Title	BUSINESS DATA ANALYTICS - LAB (COMMERCE - CA)
Total Hours	60
Hours/Week	4
Code	U20CA6MEP09
Course Type	Practical
Credits	3
Marks	100

GENERAL OBJECTIVE:
To enable the students to understand R programming logic and to develop skills in problem solving using R programming language.

COURSE OBJECTIVES
The learner will be able to

CO. No.	Course Objectives
CO-1	Setup R programming Environment ; understand and use R Variables, Operators and Data Types
CO-2	Understand and apply the concept Data Function Loops control structure in R programs.
CO-3	Understand and apply the concepts of String, R Data Structures- Arrays, Vectors and Lists.
CO-4	Demonstrate how to import R Packages and Data Setsfrom.csv (comma-separated value)file formatand.xlsx (Excel)file format.
CO-5	Understand how data is analyzed and visualized using statistic functions; to apply the techniques for plot and draw the pie chart and bar chart.

List of Exercises:

1. Download and Setup R-Programming environment and install basic packages in R program

2. Implement R-Programming Data types, Variables, Operators
    Data inputting from the User - To perform simple programs
3. Implement Flow Control in R programs
 - if …. else
 - for loop and while loop
 - break & next
 - Recursive function
 - Switch function
4.Implement Text Manipulation in R program
 - R Strings

5.Loading, Handling and Analyze Data Sets– To implement Data Structures in R file
- Arrays
- List
- Data Frames and Merging Data Frames
- Reading from csv files

6.Data exploration and visualization – To perform simple applications in R file
- Mode, Mean and Median
- Standard Deviation and Correlation
- Summary Statistics from csv file
- Creating Bar Chart, Pie Chart and Dot plot

SIMPLE APPLICATIONS:
- Employee Pay Bill Preparation
- Income Tax Calculation
- Bank Transactions
- Sales Tax Calculation
- Calculate Summary Statistics from Super Market Sales and various Business Data Set

COURSE OUTCOMES (CO):
The learners

CO.No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Setup R-Programming environment and interpret the basic principles of R programming key terminologies.	PSO 1,2	R,U, AP
CO-2	Implement R-Programming Data types, Variables, Operators in simple R programs.	PSO 1	R,U, AP
CO-3	Implement the Flow Control statements in R programs.	PSO 1	R, U, AP
CO-4	Creating and Manipulating Text in R program using String functions.	PSO 2	U, AP
CO-5	Loading, Handling and Analyze Data Sets using the concept of Data Structures in R file.	PSO 1,5	U, AP
CO-6	Implement the R programming techniques of Data exploration and visualization in simple applications in R file.	PSO 5	U, AP

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap-Apply; An–Analyse; E-Evaluate; C–Create

TEXT BOOK
Sandip Rakshit, "R Programming for Beginners", McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5.

BOOKS FOR REFERENCE:
1.Martin C. Brown, "Python: The Complete Reference", 2001, McGraw-Hill Professional
2.Andrie de Vries, Joris Meys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-
3.Hadley Wickham, Garrett Grolemund ,"R for data science : Import, Tidy, Transform, Visualize, And Model Data", O'Reilly,2017.
4.Garrett Grolemund, "Hands on Programming With R", Shroff/O'Reilly,2014.
5.Jeremy Miles, Zoe Field, "Discovering Statistics Using R", SAGE Publications Ltd,2012.