SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES

PG DEPARTMENT OF COMPUTER APPLICATIONS

BCA
2021 - 2024

(For Candidates admitted in the academic year 2021-22)

HOLY CROSS COLLEGE (AUTONOMOUS)

TIRUCHIRAPPALLI-620 002

SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES

PG DEPARTMENT OF COMPUTER APPLICATIONS

CHOICE BASED CREDIT SYSTEM

LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)

Programme Outcomes (POs)

PO 1 - Demonstrate ability and attitude to acquire knowledge and skills in the advancing global scenario to apply them effectively and ethically for professional and social development.

PO 2 - Involve in research and innovative endeavors and share their findings for the well being of the society.

PO 3 - Work effectively in teams and take up leadership in multi-cultural milieu.

PO 4 - Act with moral, ethical and social values in any situation.

PO 5 - Excel as empowered woman to empower women.

PO 6 - Participate in activities towards environmental sustainability goals as responsible citizens.

PO 7 - Pursue higher studies in the related fields of Science, Humanities and Management.

PO 8 - Promote analytical, logical, technological and computational skills to become professionals in various fields.

PO 9 - Apply the mathematical techniques and software tools to draw the solution in complex and dynamic multidisciplinary scenario.

Programme Specific Outcomes (PSOs)

PSO 1 - Apply programming skills in the areas of Software Development, Networking and Emerging Technologies.

PSO 2 - Develop Employability Computational skills for technological progress.

PSO 3 - Create innovative career paths in software development for independent and professional up skilling in the ever changing Digital era.

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
UG COURSE PATTERN
BCA

Semester	Part	Course	Title of the Course	Code	Hours/ Week	Credits	Marks
I	I	Language	Tamil Paper I/ Hindi Paper I/ French Paper I	U21TL1GEN01/ U21HN1HIN01/ U21FR1FRE01	3	3	100
	II	English	English Paper I	U21EL1GEN01	3	3	100
	III	Major Core -1	Problem Solving using C	U21CA1MCT01	5	4	100
		Major Core – 2	Problem Solving using C – Lab	U21CA1MCP02	4	2	100
		Major Core – 3	Web designing and PHP – Lab	U21CA1MCP03	4	3	100
		Allied – 1	Statistical Methods	U21MA1ALT03	4	2	100
		Allied – 2	Basics of Accounting	U21CO1ALT02	4	2	100
	IV	Environmental Studies	Environmental Studies	U21RE1EST01	2	1	100
		Value Education	Ethics I/ Bible Studies I/ Catechism I	-	1	-	-
	VI	Service Oriented Course		-	-	-	-
		Internship / Field Work / Field Project 30 Hours - Extra Credit		U21SP1ECC01	-	2 (EC)	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	U21TL2GEN02/ U21HN2HIN02/ U21FR2FRE02	3	3	100
	II	English	English Paper II	U21EL2GEN02	3	3	100
	III	Major Core – 4	Data Structures and Algorithms	U21CA2MCT04	5	4	100
		Major Core – 5	IT Hardware and Software	U21CA2MCT05	4	3	100
		Major Core – 6	Optimization Techniques	U21CA2MCT06	5	4	100
		Allied – 3	Numerical Methods	U21MA2ALT11	4	2	100
	IV	Skill Based Course(SBC) – 1	Soft Skill Development	U21SS2SBC01	2	1	100
		Skill Based Course(SBC) – 2	Sustainable Rural Development and Student Social Responsibility	U21RE2SBC02	2	1	100
		Industrial Relations	Industrial Relations	U21CA2IRT01	1	1	100
		Value Education	Ethics I / Bible Studies I/ Catechism I	U21VE2LVE01/ U21VE2LVB01/ U21VE2LVC01	1	1	100
	VI	Service Oriented Course		-	-	-	
		Internship / Field Work / Field Project30 Hours- Extra Credit		U21SP2ECC02		2 (EC)	100
		TOTAL			**30**	**23+2**	**1000+ 100**

Semester	Part	Course	Title of the course	Code	Hours/ Week	Credit	Mark
III	I	Language	Tamil Paper III/ Hindi Paper III/ French Paper III	U21TL3GEN03/ U21HN3HIN03/ U21FR3FRE03	3	3	100
	II	English	English Paper III	U21EL3GEN03	3	3	100
	III	Major Core – 7	Database Systems	U21CA3MCT07	5	4	100
		Major Core – 8	Database Management Systems – Lab	U21CA3MCP08	4	3	100
		Allied – 4	Discrete Mathematics	U21MA3ALT13	4	2	100
		Major Elective-1	Major Elective-1	-	4	3	100
	IV	Major Skill Based Elective–1	Front Office Tools - Lab	U21CA3SBP01	2	1	100
		Non Major Elective-1	Non Major Elective-1	-	3	3	100
		Gender Studies	Gender Studies	U21WS3GST01	1	1	100
		Value Education	Ethics II / Bible Studies II/ Catechism II	-	1	-	-
	VI	Service Oriented Course		-	-	-	-
		Internship / Field Work / Field Project 30 Hours - Extra Credit		U21SP3ECC03	-	2 (EC)	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	U21TL4GEN04 U21HN4HIN03 U21FR4FRE03	3	3	100
	II	English	English Paper IV	U21EL4GEN04	3	3	100
	III	Major Core – 9	Java Programming	U21CA4MCT09	4	4	100
		Major Core – 10	Java Programming -Lab	U21CA4MCP10	4	3	100
		Major Elective –2	Major Elective –2	-	4	3	100
		Allied – 5	Cost and Management Accounting	U22CC4ALT02	4	2	100
		Allied – 6	Business Software – Tally	U22CC4ALP03	4	2	100
	IV	Non Major Elective – 2	Non Major Elective -2	-	3	3	100
		Value Education	Ethics II / Bible Studies II/ Catechism II	U21VE4LVE02/ U21VE4LVB02/ U21VE4LVC02/	1	1	100
	VI	Service Oriented Course		-	-	2 (EC)	100
		Internship / Field Work / Field Project 30 Hours - Extra Credit		U21SP4ECC04		2 (EC)	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	U21CA5MCT11	4	4	100
		Major Core –12	Cloud Computing	U21CA5MCT12	4	4	100
		Major Core –13	Computer Networks	U21CA5MCT13	4	4	100
		Major Core –14	Object-Oriented Programming Using C# and.Net	U21CA5MCT14	4	4	100
		Major Core–15	Object-Oriented Programming Using C# and .Net – Lab	U21CA5MCP15	4	3	100
		Major Elective–3	Fundamentals of Data Science/ Digital Marketing	U21CA5MET05/ U21CA5MET06	4	3	100
	IV	Non Major Elective - 3	Non Major Elective - 3	-	3	3	100
		Major Skill Based Elective– 2	Multimedia – Lab	U21CA5SBP02	2	1	100
		Value Education	Ethics III / Bible Studies III/ Catechism III	-	1	-	-
	VI	Online Course		U21OC5ECT01	-	2 (EC)	100
		Internship / Field Work / Field Project 30 Hours - Extra Credit		U21SP5ECC05	-	2 (EC)	100
		TOTAL			**30**	**26+2+2**	**800+ 100+ 100**

Semester	Part	Course	Title of the course	Code	Hours/ Week	Credit	Mark
VI	III	Major Core–16	Operating Systems	U21CA6MCT16	4	4	100
		Major Core–17	Computer Graphics	U21CA6MCT17	4	3	100
		Major Core–18	Internet of Things	U21CA6MCT18	4	3	100
		Major Core–19	Big Data Analytics	U21CA6MCT19	4	3	100
		Major Core–20	Information and Cyber Security	U21CA6MCT20	4	4	100
		Major Elective-4	Data Analytics Tools -Lab/ Python Programming -Lab	U21CA6MEP07/ U21CA6MEP08	4	3	100
	IV	Non Major Elective–4	Non Major Elective – 4	-	3	3	100
		Skill Based Course(SBC) –3	Research Methodology	U21DS6SBC03	2	1	100
		Value Education	Ethics III / Bible Studies III/ Catechism III	U21VE6LVE03/ U21VE6LVB03/ U21VE6LVC03	1	--	100
	V	Extension Activity	RESCAPES - Impact study of Project	U21RE6ETF01	-	4 (EC)	100
	VI	Internship / Field Work / Field Project30 Hours - Extra Credit		U21SP6ECC06	-	2 (EC)	100
		TOTAL			**30**	**24+2+4**	**900+ 100+ 100**
		GRAND TOTAL			**180**	**140+8+12 = 160**	**5200+ 300+ 600**
VI		ED: Extra Credit(Mini Project)		U21CA6ECP01	-	2	100

LISTOF ALLIED PAPERS OFFERED BY THE DEPARTMENT TO OTHER DEPARTMENTS

Semester	Part	Course and Department	Title of the Course	Code	Hours/ Week	Credits	Mark
I	III	Biotechnology	Basics of Programming	U21CA1ALT02	4	2	100
I	III	Biotechnology	Basics of Programming Lab	U21CA1ALP03	4	2	100
II	III	B.COM(CA)	**Allied – 3** Computer Applications in Business	U21CA2ALT01	4	2	100
III	III	B.COM(CA)	**Allied – 4** R Programming – Lab	U21CA3ALP04	4	2	100
III	III	B.Sc. Physics	**Allied – 4** Database Management Systems	U21CA3ALT05	4	2	100
IV	III	B.COM(CA)	**Allied – 6** Relational Database Management System	U21CA4ALT06	4	2	100
IV	III	B.Sc. Physics	**Allied – 5** Programming in C	U21CA4ALT07	4	2	100
IV	III	B.Sc. Physics	**Allied – 6** Programming in C Lab	U21CA4ALP08	4	2	100

LISTOF MAJORELECTIVE COURSES OFFEREDBY THE DEPARTMENT:

Semester	Part	Course	Title of the Course	Code	Hrs / Wk	Credits	Mark
III	III	Major Elective –1	Modern Technology in IT/ Basic Concepts of Programming	U21CA3MET01/ U21CA3MET02	4	3	100
IV	III	Major Elective –2	Ethical Hacking	U21CA4MET03	4	3	100
V	III	Major Elective – 3	Introduction to Python Programming (III B.Com CA)	U21CA5MEP04	4	3	100
VI	IV	Major Elective -4	Relational Database Management Systems-Lab (III B.Com CA)	U21CA6MEP09	4	3	100

LIST OF NON MAJOR ELECTIVE COURSES OFFEREDBY OUR DEPARTMENT:

Semester	Part	Course	Title of the Course	Code	Hrs / Wk	Credits	Marks
III	IV	Non Major Elective-1	Basic Drawing and Editing - Lab	U21CA3NMP01	3	3	100
IV	IV	Non Major Elective - 2	Digital Art – Lab	U21CA4NMP02	3	3	100
V	IV	Non Major Elective- 3	Introduction to Smart Technologies	U21CA5NMT03	3	3	100
VI	IV	Non Major Elective- 4	Futuristic Technologies in IT	U21CA6NMT04	3	3	100

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – First Year - Semester – I

Course Title	**Major Core 1: Problem Solving using C**
Code	**U21CA1MCT01**
Course type	**Theory**
Semester	**I**
Hours/Week	**5**
Credits	**4**
Marks	**100**

CONSPECTUS

To understand the concept of problem solving approaches and to develop programmingskills using C language.

COURSE OBJECTIVES

1. To understand the concepts of algorithms and create flowcharts for a given problem
2. To apply the basic concepts of C in real-time applications
3. To analyze the control constructs, different types of arrays and apply the concepts for solving problems in real time
4. To understand the concepts of strings, user defined functions, structures and union in C
5. To 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 /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 .**MANAGING INPUT AND OUTPUT OPERATORS:** Introduction – Formatted Input – Formatted Output.

Extra Reading/Keywords*:* *Basic I/O and Control operations in C Language*

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 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 multidimensional array programs with Branching and looping constructs*

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 /Key words*: Create Programs using functions, Structures and Unions*

UNIT V **15 Hrs**

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 and Structures.

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 /Key words*: Implement the system and file concepts using Pointers.*

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

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.

SUGGESTED READINGS

1. Brian W. 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. KR Venugopal, Sudeep R Prasad, **"**Mastering C**"**, Second Edition, McGraw Hill Education Private Limited, 2015.

WEB REFERENCES

1. https://www.guru99.com/c-programming-language.html
2. https://www.tutorialspoint.com/cprogramming/index.htm
3. https://www.freecodecamp.org/news/the-c-beginners-handbook/
4. https://www.programiz.com/c-programming
5. https://www.learn-c.org/

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

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO-1	Identify the basic concepts of the programming languages and Identify and Examine the effective ways to solve the problems	K1
CO-2	Summarize and associate the correct identifiers, keywords, operators and control structures to solve the problem with reduced complexity and to promote reusability	K2
CO-3	Describe the problem, compare the appropriate pre-build functions, procedures and construct customized coding sequence to solve the problem effectively	K3
CO-4	Construct solutions to solve the real world problems and develop small to medium sized application programs to demonstrate professionally acceptable coding with performance standards	K4

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze)

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	M	M	M	L	H	H	M
CO-2	M	M	M	M	M	L	H	H	M
CO-3	H	H	H	M	M	L	H	H	M
CO-4	H	H	H	H	H	L	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	L	H
CO-3	H	H	H
CO-4	H	H	L

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – First Year - Semester – I

Course Title	**Major Core 2: Problem Solving using C Lab**
Code	**U21CA1MCP02**
Course type	**Practical**
Semester	**I**
Hours/Week	**4**
Credits	**2**
Marks	**100**

CONSPECTUS

To write code and develop application programs using C for solving real time problems.

COURSE OBJECTIVES

1. To recall the syntax of control structures and solve problems using C.
2. To remember the syntax of looping statements and solve problems using C.
3. To create programs for arrays and strings using C.
4. To develop programs for Functions, Pointers and Structures in C.
5. To 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

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO 1	Recognize the basics of C Programming	K1
CO 2	Identify and Express the basic operations in C Programming	K2
CO 3	Apply different data type, structures, functions, files and use them in programming to solve computational problems in the required domain.	K3
CO 4	Assess the best logic and methods, develop programs and Tools for solving real time problems.	K4

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze)

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	H	H	H	L	H	H	H
CO-2	H	M	H	H	H	L	H	M	H
CO-3	H	M	H	H	H	L	H	M	H
CO-4	H	H	H	H	H	L	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	M
CO-2	H	M	H
CO-3	H	M	H
CO-4	H	H	M

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – First Year - Semester – I

Course Title	**Major Core: 3 - Web Designing & PHP Programming**
Code	**U21CA1MCP03**
Course type	**Practical**
Semester	**I**
Hours/Week	**4**
Credits	**3**
Marks	**100**

CONSPECTUS

To develop and deploy websites using Script Type, Style Sheets, JQuery, HTML and PHP languages.

COURSE OBJECTIVES

1. To understand the basic concepts of html and style sheets.
2. To perform basic operations using CSS
3. To learn how to use JQuery for effective website creation
4. To learn various functions of MySQL
5. To understand the Scripting language of website creation

Exercises:

HTML5 & CSS:

1. Create a HTML page with Headers, Linking and Images.
2. Create a HTML page to generate Frames, Unordered Lists, Nested and Ordered Lists
3. Create a HTML page to prepare Tables and Formatting
4. Create a HTML page to develop Forms and add Image Maps,Tags

JAVA SCRIPT:

1. Write a script to generate Random Numbers 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
2. Create simple PHP code using Functions.

FORM processing using PHP.

1. Connect to MySQL from PHP, PHP MySQL Connectivity
2. Create Databases and Tables with PHP Programs
3. Create PHP code for Storing data and Retrieving data.

COURSE OUTCOMES:

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO 1	Recall the basic concepts of HTML5, CSS, Java Script, JQuery, PHP and MySQL	K1
CO 2	Demonstrate the basic operations of web designing and PHP programming for creating websites	K2
CO 3	Apply and Identify the best approach to utilize the various mark up languages, JQuery, MySQL and scripting languages in the process of web designing	K3
CO 4	Develop and construct websites for real time applications	K4

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze)

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	M	H	H	H	L	M	M	M
CO-2	M	M	H	H	H	L	M	M	M
CO-3	M	M	H	H	H	L	M	M	M
CO-4	H	H	H	H	H	L	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	M	M	M
CO-3	M	M	M
CO-4	H	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – First Year - Semester – I

Course Title	**Basics of Programming(BIO-TECHNOLOGY)**
Code	**U21CA1ALT02**
Course type	**Theory**
Semester	**I**
Hours/Week	**4**
Credits	**2**
Marks	**100**

CONSPECTUS

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

COURSE OBJECTIVES

1. To understand the evolution of programming languages.
2. To Understand the concepts of algorithms and create flowcharts for a given problem
3. To Understand &analyze the C features and Program Structure.
4. To Acquire programming skills in scripting language.
5. Apply Structured Query Language to access data from database.

UNIT I **12 Hrs**

COMPUTER FUNDAMENTALS Compute Everywhere - & Generations R : R History - 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

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.

SUGGESTED READINGS

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.

WEB REFERENCES:

1. https://www.w3schools.com/sql
2. https://developer.mozilla.org/en-US/docs/Web/HTML
3. https://www.programiz.com/c-programming
4. http://lgatto.github.io/sql-ecology/01-sql-basic-queries.html
5. https://html.com/

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

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO-1	Recognize the fundamental concepts of computer, algorithm designs, C language, Scripting language and databases.	K1
CO-2	Interpret the different data types, operators, logics, algorithms and database transactions	K2
CO-3	Identify and apply the best logics and formulate algorithms to solve real time applications	K3
CO-4	Construct and develop the websites for medium and large real time applications for various domains	K4

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze)

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	M	H	H	H	L	M	M	M
CO-2	M	M	H	H	H	L	H	H	M
CO-3	H	M	H	H	M	L	H	H	H
CO-4	H	H	H	H	H	L	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	M	M	M
CO-3	H	H	M
CO-4	H	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – First Year - Semester – I

Course Title	**Basics of Programming Lab(BIO-TECHNOLOGY)**
Code	**U21CA1ALP03**
Course type	**Practical**
Semester	**I**
Hours/Week	**4**
Credits	**2**
Marks	**100**

CONSPECTUS

Student can writes application programs using C and can able to know basics of HTML scripting language and working of databases.

COURSE OBJECTIVES

1. To recall the syntax of control structures and solve problems using C
2. To remember the syntax of looping statements and solve problems using C
3. To acquire programming skills in scripting language.
4. To comprehend the differences between typical scripting languages and application programming languages
5. To understand to create and manipulate tables using sql queries

EXERCISES C

1. Write a program to print sample strings like “hello world”, “Welcome to C Programming” with different formats using escape sequences.
2. Write a Program to print different data types in „C“ and their ranges.
3. Write a Program to demonstrate arithmetic operators. (+,-,*,/,%)
4. Read 3 integer values and find the largest among them
5. Write a program to find out the leap year
6. Write a program to find out the Factorial

HTML

1. Create a webpage that prints the message “When was this webpage created? Check page’s title for the answer” to the screen, and set the title of the page of current date.
2. Create links to five different pages on five different websites.
3. Display five different images. Skip two lines between each image and each image should have a title.

SQL

1. Design a Database and create required tables. For e.g. Bank, College Database.
2. Writing Basic SQL SELECT Statements.
3. Write a sql statement for implementing retrieval queries.
4. Use ALTER, MODIFY.

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO-1	Recognize various operations in C to solve various problems	K1
CO-2	Interpret and apply screen based user interfaces with graphics, textual components and navigation systems to achieve a unified functional environment that results in static web page	K2
CO-3	Apply the basic concepts of database systems and construct queries using SQL in database interaction and creation.	K3
CO-4	Construct and develop websites for real time applications	K4

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze)

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	H	L	L	L	H	M	M	M
CO-2	H	H	M	H	L	M	M	M	M
CO-3	H	H	M	H	H	H	M	M	M
CO-4	H	H	M	H	H	H	H	H	M

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	L
CO-2	M	M	L
CO-3	M	M	M
CO-4	M	M	M

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – First Year - Semester – II

Course Title	**Major Core : 4 - Data Structures and Algorithms**
Code	**U21CA2MCT04**
Course type	**Theory**
Semester	**II**
Hours/Week	**5**
Credits	**4**
Marks	**100**

GENERAL OBJECTIVE

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

COURSE OBJECTIVES

1. To learn the fundamental Concepts of Data Structures.
2. To understand the working principles of Queues and Linked Lists.
3. To study how to balance a Binary Search trees and 2-3 and so on other Trees.
4. To understand the various sorting algorithms, including insertion sort, selection sort, merge sort, heap sort, quick sort, linear search and Non linear search
5. To understand the concepts of Graphs and its terminologies.

UNIT-I **15 Hrs**

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 – Representation of Stack: Implementing the Push and Pop operation – **APPLICATIONS:** Arithmetic Expressions – Polish Notation – Evaluation of Postfix Expression – Transforming an Infix Expression into Postfix.

Extra Reading /Key words: *two dimensional and multi-dimensional array concepts.*

UNIT-II **15 Hrs**

QUEUES: Representation of Queue using an Array – Enque and Deque Operations – Priority Queue using an array.

LINKED LISTS: Representation of Linked list in memory – Traversing a Linked list- Inserting after a given node – Deleting the node following a given node.

Extra Reading /Key words: *real time applications of Stacks & Linked Lists.*

UNIT-III **15 Hrs**

TREES: Binary Trees: Representing Binary Tree - Operations on Binary trees - Traversing Binary Tree – Binary Search Tree – Searching and Inserting in Binary Search tree-Types of Binary Tree.

Extra Reading /Key words: *Tree Traversals, Binary Search Tree.*

UNIT-IV **15 Hrs**

SORTING: Insertion Sort - Selection Sort - Heap Sort - Quick Sort- Merge Sort – Shell Sort.
SEARCHING : Linear search and Non Linear search.
Extra Reading /Key words: *Applications of Sorting Techniques.*

UNIT-V **15 Hrs**

GRAPHS: Introduction- Graph terminologies - Representation of Graphs: Set Representations – Linked Representations - Warshall"s Algorithm – Shortest Path Algorithm – Dijkstra's Algorithm and Floyd's Algorithm**.**
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.

TEXT BOOKS

1. **Samanta D**, "**Classic Data Structures"**, 2005, Prentice Hall of India Private Ltd, New Delhi.
   Unit – I,II,IV,V.
2. **Schaum's, "Data Structures with C"**, 2006, Second Edition.
   Unit – I, II, III.

SUGGESTED READINGS

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.

WEB REFERENCE

1. https://www.programiz.com/dsa
2. https://www.geeksforgeeks.org/array-data-structure
3. https://www.tutorialspoint.com/data_structures_algorithms/stack_algorithm
4. https://www.w3schools.com/datascience/ds_data.asp
5. https://www.w3adda.com/data-structure-tutorial/difference-between-stack-and-queue-in-data- structure

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

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level
CO-1	Identify the concepts of Arrays, Stack, Queues and Linked List	K1
CO-2	Compare and associate Stack, Queues, various Linked Lists, binary tree traversal, the operations of binary tree and Sorting algorithms	K2
CO-3	Apply various data structures and operations in the real time projects.	K3
CO-4	Investigate various sorting algorithms and shortest path algorithms	K4

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze)

PO–CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	H	H	H	L	M	H	H
CO-2	H	M	H	H	H	L	M	H	H
CO-3	H	M	H	H	H	L	M	H	H
CO-4	H	H	H	H	H	L	H	M	M

PSO–CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	M
CO-2	H	H	M
CO-3	H	H	H
CO-4	H	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – First Year - Semester – II

Course Title	**Major Core 5 – IT HARDWARE AND SOFTWARE**
Code	**U21CA2MCT05**
Course type	**Theory**
Semester	**II**
Hours/Week	**4**
Credits	**3**
Marks	**100**

CONSPECTUS

To give Basic Knowledge on the fundamentals of computer hardware components, assembly, upgrading, setup and configuration of the system and to learn about networking connections, trouble shooting and installation of various drives.

COURSE OBJECTIVES

1. To Learn the fundamentals of PC technology and memory works
2. To understand the motherboard ,power supply and cooling protection
3. To classify the I/O Ports, Keyboard and mouse Interface
4. To Illustrate the Troubleshooting tools and Data, Disaster Recovery
5. To Illustrate OS installation and PC maintenance tools and troubleshooting techniques

UNIT I **12 Hrs**

Fundamentals of PC Technology: Fundamental building blocks of the PC - Principles of CPU operation - Trouble shooting the CPU: Handling and replacing the CPU- CPU configuration- CPU troubleshooting checklist - Memory: How memory works - Troubleshooting memory - Advanced memory technologies: DRAM – DDRAM – PPRAM.

Extra Reading /Key words: *Cache Memory, Virtual Memory*.

UNIT II **12Hrs**

Motherboards: Motherboard controllers and system resources - The I/O system bus - On board I/O devices – Chipsets - ROM BIOS - ROM POST - The power supply - Ventilation and cooling protection.

Extra Reading /Key words: *SATA Ports, M.2 connector*

UNIT III **12Hrs**

External I/O Interfaces: Introduction to I/O Ports - Serial Vs Parallel –Universal Serial Bus (USB) – Input Devices: Keyboards/Mouse Interface - Keyboard troubleshooting and Repair – Mouse troubleshooting – Wireless Input Devices – Power management features of wireless input devices – Troubleshooting wireless input devices.

Extra Reading /Key words: *I/O mode, DMA mode*

UNIT IV **12Hrs**

Troubleshooting Tools and Techniques: Tools of the Trade - Basic PC Handling Techniques. Basic data recovery and disaster recovery: Disk structure and Data recovery: partitions- the master boot record- partition tables- extended partitions- file allocation tables - Disaster recovery.

Extra Reading /Key words: *Task Manager, stack overflow*

UNIT V **12Hrs**

Installing the drives – Installing the OS – System Startup – Troubleshooting new installations – PC Diagnostics – The Boot process – PC maintenance tools – PC maintenance – Preventive maintenance – Troubleshooting Techniques and Tips-E-Waste.

Extra Reading /Key words: *Recovery Software, Antivirus*

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

TEXT BOOKS

1. Craig Zacker and John Rourke, "The Complete Reference PC Hardware", 2001, Tata McGraw – Hill Publishing Company, New Delhi.
   - UNIT I – Chapters 1,2
   - UNIT II – Chapters 4,5
   - UNIT III – Chapter 9
   - UNIT IV – Chapters 17,18
2. Scott Mueller's, "Upgrading and Repairs PCs", 19th Edition, 2010, Pearson Education Inc.
   - UNIT III- Chapter 15
   - UNIT V –Chapters 19,20
3. Lakshmi Raghupathy, "Introduction to E-Waste Management", 2018, The Energy and Resources Institute, TERI.
   - UNIT V –Chapter 2

SUGGESTED READINGS

1. Joel Rosenthal, Rev. Msgr. Kevin W. Irwin,"PC Repair and Maintenance: A Practical Guide", 2003, Charles River Media.
2. Winn L.Rosch, "The Winn L.Rosch Hardware Bible", 2003, A Prentice Hall Computer, 6th Edition.
3. Kate J.Chase, " PC Hardware and A+ Handbook", 2004, Microsoft Corporation.
4. Anfinson David, Quamme Ken, "IT Essentials – PC Hardware and Software Companion Guide", 2008, Cisco Press, Pearson India.
5. Ron Gilster, "PC Hardware: A Beginner's Guide", 2001, Tata McGraw – Hill Publishing Company, New Delhi.

WEB REFERENCES

1. https://support.microsoft.com
2. https://edu.gcfglobal.org
3. https://www.howtogeek.com
4. https://www.computerhope.com
5. https://www.extremetech.com

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

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level
CO-1	Understand fundamentals of PC technology and memory types	K1
CO-2	Recognize and distinguish motherboard, power supply and cooling protection	K2
CO-3	Classify the I/O Ports, Keyboard and mouse Interface	K3
CO-4	Implement OS installation Troubleshoot the PC problems	K4

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate, K6=Create)

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	L	L	H	H	L	M	M	M
CO-2	M	L	H	H	H	L	M	H	M
CO-3	H	L	H	H	M	L	M	H	H
CO-4	H	M	H	H	H	H	M	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	M	M	M
CO-3	H	H	M
CO-4	H	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – First Year - Semester – II

Course Title	**MAJOR CORE- 6: OPTIMIZATION TECHNIQUES**
Code	**U21CA2MCT06**
Course type	**Theory**
Semester	**II**
Hours / Week	**5**
Credits	**4**
Marks	**100**

CONSPECTUS

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

COURSE OBJECTIVES

1. To understand the L.P.P and finding solution by Graphical and Simplex Method.
2. To understand the sequencing problem and obtaining the sequence of processing n jobs through two machines and k machines.
3. To understand the various methods of transportation problem for obtaining initial basic feasible solution and understand the Hungarian method and Travelling Salesman problem
4. To evaluate the inventory control theory, finding EOQ and evaluate the solution of inventory problem with uncertain demand.
5. To evaluate the 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 – Applications of LPP in Production Management.

Extra Reading/ Keywords*: Revised simplex method, Dual simplex method.*

UNIT II : SEQUENCING PROBLEM 15 Hrs

Sequencing problem - processing n jobs through two machines - processing n jobs through k machines – Applications of sequencing problem in industry.

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-Applications of transportation 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 – Applications of inventory in environmental science.

Extra Reading/ Keywords*:* Multi-item Deterministic problems

UNIT V: NETWORK SCHEDULING **15 Hrs**

Introduction to network problems - Network scheduling by CPM and PERT – Applications of network analysis in telecommunications.

Extra Reading/ Keywords*: Time cost Optimization Algorithm, Resource allocation and scheduling.*

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

TEXT BOOKS

Kantiswarup, P.K.Gupta & Man Mohan, (2009) OPERATIONS RESEARCH, Sultan Chand & Sons, New Delhi.

UNIT - I - Chapter 2 ,Chapter 3 : 3.1 -3.5 ,Chapter 4: 4.1- 4.3

UNIT II- 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

SUGGESTED READINGS

1. H. Taha(IV Edition) OPERATIONS RESEARCH ,Prentice Hall of India 2006.
2. P. K. Gupta, D. S. Hira, (2001) PROBLEMS IN OPERATIONS RESEARCH, S.Chand ,New Delhi.
3. Dr. H.K. Pathak, Dr. Pradeep K. Joshi & Dr. C. Sharma(1 January 2021) , OPERATIONS RESEARCH, Shree Shiksha Sahitya Prakashan Publisher Second Revised Edition , India.

WEB REFERENCE:

1.http://www.nitjsr.ac.in/course_assignment/CA02CA3103%20RMTLPP%20%20Formulation.pdf
2.http://cs.uok.edu.in/Files/79755f07-9550-4aeb-bd6f-5d802d56b46d/CustomSequencing%20Problem.
3.http://www.producao.ufrgs.br/arquivos/disciplinas/382_winston_cap_7_transportation.pdf
4.https://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf
5.https://www2.kimep.kz/bcb/omis/our_courses/is4201/Chap14.pdf

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

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO – 1	Recall the concepts of LPP, Sequencing problem, Transportation problem, Assignment problem, Inventory Control, PERT and CPM.	**K1**
CO – 2	Derive the mathematical formulation with the understanding of LPP, Sequencing Problem, Transportation Problem, Inventory Control and Network Scheduling.	**K2**
CO – 3	Solve the LPP using graphical, simplex method, transportation problem and assignment problem. Solving the inventory problems with shortages, without shortages and EOQ problem with price breaks. Obtain optimum solution for networking using PERT & CPM	**K3**
CO – 4	Constructing the LPP model, Sequencing Problem and network diagrams for handling real life situation. Framing Inventory control model to enhance sustainable Environment.	**K4**

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze)

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	H	M	M	M	M	H	H	H
CO-2	H	H	H	M	H	M	H	H	H
CO-3	H	H	H	H	H	M	H	H	H
CO-4	H	H	H	H	H	H	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	M
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
B.Com.CA – First Year - Semester – II

Course Title	**ALLIED 3** **COMPUTER APPLICATIONS IN BUSINESS**
Code	**U21CA2ALT01**
Course type	**Theory**
Semester	**II**
Hours/Week	**4**
Credits	**2**
Marks	**100**

CONSPECTUS

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

1. To understand the components, importance and roles of information technology and emerging trends in different fields
2. To remember and understands the terminologies of operating system
3. To understand the working of MS-WORD and apply it in creating and editing documents
4. To explain the features of Excel environment and create worksheets
5. To develop power point presentation with multimedia effects
6. To understand ecommerce framework with real-time applications.

UNIT I **12 Hrs**

INFORMATION TECHNOLOGY: Introduction: Meaning and Need of IT – Components - Importance of information technology in our society. **Role of IT**: It in Business, IT in Manufacturing Industries and Smart Manufacturing, IT in Defense Services, IT in Public Sector, IT in Defense, IT in Media, IT in Publication and IT in Entertainment.

Emerging Trends in IT: E-Commerce, IT And Supply Chain Management, Artificial Intelligence (AI) and Machine Learning, Robotic Process Automation (RPA), Edge Computing, Blockchain, Internet of Things (IoT), 5G, Cyber Security

Extra Reading/ Keywords *: 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/ Keywords *: 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/ Keywords: *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/ Keywords: *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/ Keywords *:Usage of E-purchase Websites*

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

TEXT BOOKS

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.

SUGGESTED READINGS

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.

WEB REFERENCES

https://www.tutorialspoint.com/computer_concepts
https://connect.comptia.org/blog/emerging-trends-in-information-technology
https://www.tutorialspoint.com/ word /excel/powerpoint/ms_access
https://www.javatpoint.com

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

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO-1	Remember the basic concepts of Information Technology, Operating Systems, MS-Offics and Applications of E-Commerce.	K1
CO-2	Understands the components, roles of information technology, emerging IT trends in different fields, the terminologies of Operating System and features of Microsoft Office	K2
CO-3	Apply MS- Office tools to organize, manage and present information, data and figures.	K3
CO-4	Analyze the needs and construct solutions to solve the real world problems by using Word, to create, polish, and share documents; Excel, to analyze and visualize data; PowerPoint, to create, collaborate, and effectively present ideas	K4

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze)

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	M	M	H	H	H	M	M	M
CO-2	M	M	M	H	H	H	M	M	M
CO-3	H	H	H	H	H	H	M	H	H
CO-4	H	H	H	H	H	H	M	M	M

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	M	M	M
CO-3	H	H	M
CO-4	H	H	M

(For Candidates admitted in the academic year 2021-22)

HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002

SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES

PG DEPARTMENT OF COMPUTER APPLICATIONS

CHOICE BASED CREDIT SYSTEM

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

BCA – Second Year - Semester – III

Course Title	**Major Core - 7 : Database Systems**
Code	**U21CA3MCT07**
Course type	**Theory**
Semester	**III**
Hours/Week	**5**
Credits	**4**
Marks	**100**

CONSPECTUS

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

COURSE OBJECTIVES

1. To understand the basic concepts of database management systems.
2. To apply Structured Query Language to access data from database.
3. To identify different data models and relate E-R model with the relations.
4. To apply Normalization techniques to refine the database.
5. To analyze Transaction Processing and Concurrency Control mechanism in database Systems.

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/Key words*: 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/Key words*: 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/Key words: *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/Key words*:* *6NF, ONF*

UNIT- V Transaction Processing **15Hrs**

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/Key words*:* *Web Server, Transaction Processing Monitor*

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

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO-1	Identify the basic concepts of database management systems and Identify and Examine the effective ways to solve the queries	K1
CO-2	Summarize and associate the relations with database schema and relate relational algebra notation with relational operation.	K2
CO-3	Apply SQL queries to access the data from the database.	K3
CO-4	Construct different databases by applying normalization techniques to solve the real world problems.	K4
CO-5	Evaluate the real time problems such as electricity bill and analyse the consumption charge variation among the months in a year	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

CO – Course Outcomes

PRESCRIBED TEXT BOOKS

1. S.K. Singh, “Database Systems - Concepts, Design and Application”, Pearson Education, 1st edition, 2013.

SUGGESTED READINGS

1. G.K. Gupta**," Database Management System",**2011, Tata McGraw Hill Publications Company Limited, 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"**, 2nd Edition, Morgan Kaufmann,2006

WEB REFERENCES

1. https://www.javatpoint.com/dbms-tutorial
2. https://www.tutorialspoint.com/dbms/index.htm
3. https://www.w3schools.com/sql/sql_intro.asp
4. https://www.w3schools.in/dbms
5. https://www.w3resource.com/sql-exercises/

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

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	H	M	H	L	H	H	H
CO-2	H	M	M	M	M	L	M	H	H
CO-3	H	H	H	M	H	L	H	H	H
CO-4	H	H	H	M	H	L	M	H	H
CO-5	H	H	H	M	H	M	M	M	M

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	M
CO-2	H	L	M
CO-3	H	H	H
CO-4	M	H	H
CO-5	M	H	M

(For Candidates admitted in the academic year 2021-22)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – Second Year - Semester – III

Course Title	**MAJOR CORE - 8 - DATABASE MANAGEMENT SYSTEMS – LAB**
Code	**U21CA3MCP08**
Course type	**Practical**
Semester	**III**
Hours/Week	**4**
Credits	**3**
Marks	**100**

CONSPECTUS

To acquire skills in using SQL commands for data definition and data manipulation.

COURSE OBJECTIVES

1. To create table and apply SQL commands.
2. To perform various aggregate functions and set operators using queries.
3. Provide practices to partition the table, usage of nested queries.
4. To develop PL/SQL program to prepare mark sheet, pay slip, electricity bill.
5. To develop PL/SQL program to prepare multiplication table, count the strings.

EXERCISES

1. Table creation and simple queries.
2. Queries using aggregate functions.
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 programto prepare mark sheet.
9. PL/SQL programto prepare a pay slip.
10. PL/SQL programto prepare the electricityBill.
11. PL/SQL program to prepare the multiplication table for a given number.
12. PL/SQL programto count the number of characters and digits in a string.

COURSE OUTCOMES
The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO-1	Recognize the basic concepts of database systems.	K1
CO-2	Understand various advanced queries execution such as relational constraints, joins, set operations, aggregation functions, views and embedded SQL.	K2
CO-3	Apply the basics of SQL and construct queries using SQL in database creation and interaction.	K3
CO-4	Develop and implement database applications on own.	K4
CO-5	Evaluate the real time problems such as house hold expenses and analyze the expense variation among the months in a year and decide what could be reduced.	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

CO - Course Outcomes

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	H	H	M	H	M	H	H	H
CO-2	H	M	H	H	H	L	H	H	H
CO-3	H	H	H	M	H	L	H	H	H
CO-4	H	H	H	M	H	L	H	H	H
CO-5	M	H	H	H	H	M	M	M	L

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	M
CO-2	H	H	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	M

(For Candidates admitted in the academic year 2021- 22)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – Second Year - Semester – III

Course Title	**MAJOR ELECTIVE -1 - MODERN TECHNOLOGY IN IT**
Code	**U21CA3MET01**
Course type	**Theory**
Semester	**III**
Hours/Week	**4**
Credits	**3**
Marks	**100**

CONSPECTUS

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

1. Understand the concepts of Cloud Computing Services, Layers and Models;
2. Apply the concepts of Wireless sensor network;
3. Analyze the different Stack layers of big data;
4. Understand the Mobile security;
5. Understand the differences between forward chaining and backward chaining.

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- SevenStep Modelof 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 NFVfor 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 DataManagement 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: SecurityInfrastructure – Interfaces and Feeds to and from Applications and the Internet – Layer 2: Operational Databases – Layer 3: Organizing Data Services and Tools – Layer 4: Analytical DataWarehouses – 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 Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO 1	Describe technology trends that presently drive or are expected to drive the selection of new technologies over the next decade	K1
CO 2	Know how to effectively use advanced search and selection metrics for identifying and selecting new technology	K2
CO 3	Apply Apriori algorithms and Find the Frequent Item sets; and Identify factors affecting the successful adoption of new information technologies	K3
CO 4	Analyze the key attributes, business benefits, risks, and cost factors of a new technology	K4
CO 5	Evaluate the current and emerging technologies and their implications for social ethics and global workplace	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

CO – Course Outcomes

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**", AWiley 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

WEB REFERENCES

1. https://jump2learn.com/SubjectDetails/202_2
2. https://connect.comptia.org/blog/emerging-trends-in-information-technology
3. https://www.mobileappdaily.com/future-technology-trends/
4. https://programs.online.american.edu/mshcm/masters-in-healthcare-management/courses/emerging-technology-trends
5. https://digitalregulation.org/3004297-2/

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

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	M	M	M	L	H	H	M
CO-2	M	M	M	M	M	L	H	H	M
CO-3	H	H	H	M	M	L	H	H	M
CO-4	H	H	H	H	H	L	H	H	H
CO-5	H	H	H	H	H	L	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – Second Year - Semester – III

Course Title	**MAJOR ELECTIVE - 1 : BASIC CONCEPTS OF PROGRAMMING**
Code	**U21CA3MET02**
Course type	**Theory**
Semester	**III**
Hours/Week	**4**
Credits	**3**
Marks	**100**

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

COURSE OBJECTIVES
1. Explain algorithm and flowchart symbols;
2. Familiarize the concepts of Constants, Variables, Keywords and Data types;
3. Discuss the various types of operators and statements such as Sequential, Conditional and Decision Making;
4. Understand the Loop constructs, different types of arrays;
5. Understand the basics of functions, procedures and file management.

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 OperationModes - 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 Assignmentand Seminars.

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level(K1-K6)
CO-1	Identify the basic concepts of the programming language and examine the effective way to solve problem	K1
CO-2	Classify the various types of operators and statements such as Sequential, Conditional and Decision Making; and Discuss the concepts of Constants, Variables, Keywords and Data types;	K2
CO-3	Apply the concept of Loop constructs, different types of arrays for solving Simple real world problems;	K3
CO-4	Construct solutions using the concept of functions, procedures and file management for developing Simple Programs – Analyze the difference between C and C++ programs.	K4
CO-5	Evaluate the syntax, semantics and performance of various concepts in programming languages C and C++.	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

CO – Course Outcomes

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 EducationPrivate 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, 2ndedition, 2012.

WEB REFERENCES

1. https://www.guru99.com/c-programming-language.html
2. https://www.tutorialspoint.com/cprogramming/index.htm
3. https://www.freecodecamp.org/news/the-c-beginners-handbook/
4. https://www.programiz.com/c-programming
5. https://www.learn-c.org/

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

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	M	M	M	L	H	H	M
CO-2	M	M	M	M	M	L	H	H	M
CO-3	H	H	H	M	M	L	H	H	M
CO-4	H	H	H	H	H	L	H	H	H
CO-5	M	H	L	L	L	L	M	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

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

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – Second Year - Semester – III

Course Title	**MAJOR SKILL BASED ELECTIVE (MSBE)-1 - FRONT OFFICE TOOLS – LAB**
Code	**U21CA3SBP01**
Course type	**Practical**
Semester	**III**
Hours/Week	**2**
Credits	**1**
Marks	**100**

CONSPECTUS

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:

1. To understand the concepts of creating a document, formatting the text, spell check and printing the document.
2. To understandthe concepts of providing mass distribution of mails using Mail Merge and using tables to present textual and numerical data.
3. To apply Formatting to Spreadsheet for organizing the data.
4. To apply formulas in Spreadsheet and to analyze the data visually through graphical representations
5. To 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:

e. Character formatting
f. Paragraph formatting
g. Page formatting

3. Spell check the document using:

h. Finding and Replacing of text
i. Bookmarks and Searching for a Bookmarks
j. Checking Spelling and Grammar automatically
k. Checking Spelling and Grammar using Dictionary

4. Print the document using:

l. Print Preview
m. Print Dialog box

5. Mail Merge in MS-WORD

n. Create main document and data file for mail 15merging
o. Merging the files
p. From letters using mail merging
q. Mailing labels using mail merging

6. Table creation in MS-WORD

r. Create a table in the document
s. Add row, column to a table
t. Changing column width and row height.
u. Merge, split cells of table.
v. Use formulae in tables.
w. sorting data in a table.
x. 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 cellalong 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 performthe 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
    a. layout of opening screen in Power Point
    b. the toolbars in MS Power Point
    c. Choose Auto Layout for a new slide.
    d. Insert text and pictures into a blank slide.
    e. Insert new slides into the presentation.
    f. Apply slide transition effects.
    g. Slide show.
    h. Set animation to text and pictures in a slide
    i. Set the sounds, order and timing for animation

COURSE OUTCOMES
The Learner will be able to

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO-1	Define the basic concepts of MS-WORD, MS-EXCEL and MS-POWERPOINT	K1
CO-2	Discuss the concepts of creating documents, data analysis, graphical representations and preparing presentations.	K2
CO-3	Solve real time applications using appropriate formulae and Use correct formatting to organize the data	K3
CO-4	Examine the data visually through graphical Representations and Create professional presentations for any given topic.	K4
CO-5	Evaluate the real time problems: Assess the performance of the students for the past 5 years using charts.	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)
CO – Course Outcomes

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	M	M	M	L	H	H	M
CO-2	M	M	M	M	M	L	H	H	M
CO-3	H	H	H	M	M	L	H	H	M
CO-4	H	H	H	H	H	L	H	H	H
CO-5	H	H	H	M	H	M	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – Second Year - Semester – III

Course Title	**NON MAJOR ELECTIVE -1- BASIC DRAWING AND EDITING – LAB**
Code	**U21CA3NMP01**
Course type	**Practical**
Semester	**III**
Hours/Week	**3**
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

1. To understand the techniques of photo editing;
2. To apply the tools to convert photograph to SVG;
3. To understand the various tools to create a abstract line;
4. To understand the techniques for resize and crop images;
5. To understand the concepts 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 coolabstract 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

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO 1	Recognize the basic concepts of inkscape.	K1
CO 2	Understand various tools, layers and color palets.	K2
CO 3	Apply the concepts to create logo and text effect with design patterns.	K3
CO 4	Create flyer, invitation, effects in images and conversion.	K4
CO-5	Evaluate high resolution and low resolution images and propose the steps to have high resolution images	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

CO – Course Outcomes

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	H	H	H	M	M	H	M	M
CO-2	H	H	H	H	H	H	H	H	H
CO-3	H	H	H	H	H	M	H	H	H
CO-4	H	H	H	H	H	H	H	H	H
CO-5	H	H	M	M	H	M	M	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICEBASED CREDIT SYSTEM
Allied - Second Year - Semester – III

Course Title	**R Programming - Lab (COMMERCE)**
Code	**U21CA3ALP04**
Course type	**Practical**
Semester	**III**
Hours/Week	**4**
Credits	**2**
Marks	**100**

CONSPECTUS

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

1. To remember the variables, data types, strings, operators, arrays, and matrices using R;
2. To understand the various data frames, factors and frames;
3. To understand the techniques for graphics;
4. To apply the techniques for plot, and draw the pie chart and bar chart;
5. To understand and develop creative applications using R.

Basics:

1. Write a R programto get the first 10 Fibonacci numbers.
2. Write a R programto get all prime numbers up to a given number.
3. Write a R programto print the numbers from 1 to 100 and print "Fizz" for multiples of 3, print "Buzz" for multiples of 5, and print "Fizz Buzz" for multiples of both.
4. Write a R programto extract first 10 English letter in lower case and last 10 letters in upper case and extract letters between 22^{nd} to 24^{th} letters in upper case.
5. Write a R program to find the factors of a given number.
6. Write a R programto 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 3×3 matrix 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 each value.

Advanced:

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

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO 1	Remember the basic concepts of R Programming	K1
CO 2	Understand variables, data types, strings, operators, arrays, matrices various data frames, factors and frames	K2
CO 3	Apply the various techniques for visualization	K3
CO 4	Analyze datasets using R techniques from various domains	K4
CO-5	Evaluate the real time datasets for different domains	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

CO – Course Outcomes

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	L	L	L	M	L	M	H	H	H
CO-2	M	M	L	M	L	M	H	H	H
CO-3	H	H	M	M	L	M	H	H	H
CO-4	H	H	H	H	M	M	H	H	H
CO-5	H	H	H	H	H	M	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	L	L	L
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	M	M	M

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OFMATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICEBASED CREDIT SYSTEM
B.Sc. Physics - Second Year - Semester – III

Course Title	**Database Management Systems(PHYSICS)**
Code	**U21CA3ALT05**
Course type	**Theory**
Semester	**III**
Hours/Week	**4**
Credits	**2**
Marks	**100**

CONSPECTUS

To impart the fundamental aspects of database design, database languages, and implementation through PL/SQL Programming.

COURSE OBJECTIVES

1. To understand, analyze the basics of database systems and its architecture
2. To understand Structured Query Language to access desired data from database.
3. To identify different data models and convert E-R model with relation.
4. To Apply Normalization techniques to refine database
5. To understand and develop PL/SQL programs for database

UNIT I : Introduction to DBMS **12 Hrs**

Introduction to Database Systems: Basic Concepts and Definitions - Data Dictionary - Database - Database System – Data Administrator - Database Administrator - Database System Architecture

Extra reading/Key words*:* *DB Software, Big Data*

UNIT II : Structured Query Language **12 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

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- Entity-Relational Model- Basic E-R Concepts: Entities- Relationships- Attributes

Extra reading/Key words : *EER Model, Advanced Data Analysis*

UNIT- IV Normalization **12 Hrs**

Introduction – Normalization - Normal Forms - BCNF – Multi-value Dependencies and 4NF – Join Dependencies and 5NF

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 – ImplicitCursor – Exception Handlers.

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 learner will be able to

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO-1	Describe the basic concepts of the database systems, SQL, Data model, PL/SQL and Normalization and recognize their uses in database.	K1
CO-2	Summarize and classify the database components, data models, normalization, syntax of SQL and PL/SQL to store and retrieve data in the database.	K2
CO-3	Discover the suitable data model to construct the relations and apply the best normalization techniques to manipulate the relations. Develop SQL and PL/SQL programs to store, modify, and retrieve data in the relations.	K3
CO-4	Analyze the data modes, normalization techniques, different SQL and PL/SQL constructs to solve the real world problems using relations and develop small to medium sized application programs to use database	K4
CO-5	Find the normal form of table and recommend the correct normal form to eliminate duplicate values. Access the values using PL/SQL embed with suitable queries and cursors.	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

CO – Course Outcomes

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 Private Limited, New Delhi, Sixth Printing, 2010.

SUGGESTED READINGS

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 EducationPublications, New Delhi.

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.

WEB REFERENCES

1. https://www.javatpoint.com/dbms-tutorial
2. https://www.tutorialspoint.com/dbms/index.htm
3. https://www.oracle.com/in/database/what-is-data-management/
4. https://www.oracletutorial.com/plsql-tutorial/
5. https://www.plsqltutorial.com/
6. https://www.mysql.com/

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

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	M	M	M	L	H	H	M
CO-2	M	M	M	M	M	L	H	H	M
CO-3	H	H	H	M	M	H	H	H	H
CO-4	H	H	H	H	H	H	H	H	H
CO-5	H	H	H	H	H	H	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	L
CO-5	H	H	L

(For Candidates admitted from the academic year 2021-22 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002

SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES

PG DEPARTMENT OF COMPUTER APPLICATIONS

CHOICE BASED CREDIT SYSTEM

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

BCA

Second Year - Semester – IV

Course Title	**MAJOR CORE - 10 - Java Programming - Lab**
Code	**U21CA4MCP10**
Course type	**Practical**
Semester	**IV**
Hours/Week	**4**
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:

1. To Design and implement programs in the Java programming language that make strong use of classes and object.
2. To create a program to print formatted text to the console output and read/parse console input text using a Scanner object.
3. To apply logical constructs for branching and loops as well as use iterate objects when Appropriate.
4. To create the polymorphism through use of super-classes and interfaces;
5. To design and implement customchecked and unchecked exception types;

Exercises:

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

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level
CO-1	Describe the concepts of OOPS	K1
CO-2	Categorize the concepts of classes and objects	K2
CO-3	Apply the concepts of arrays and inheritance	K3
CO-4	Identify the concepts of packages and inheritance	K4
CO-5	Construct the applet program using Exception Handling	K5

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate)

PO–CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	H	H	M	M	H	H	H	H
CO-2	H	H	H	M	M	H	H	H	H
CO-3	H	H	H	M	M	H	H	H	H
CO-4	H	H	H	M	M	H	H	H	H
CO-5	H	H	H	M	M	M	H	H	H

PSO–CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted from the academic year 2021-22 onwards)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA
Second Year - Semester – IV

Course Title	**MAJOR ELECTIVE - 2 - Ethical Hacking**
Code	**U21CA4MET03**
Course type	**Theory**
Semester	**IV**
Hours/Week	**4**
Credits	**3**
Marks	**100**

CONSPECTUS

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:

1. To understand the basic concepts of Computer
2. To understand the usage of computer and Computer Security issues
3. To understand the Impacts of Hacking, the types of Hackers and the framework of ethical hacking for enhancing the security;
4. To understand the Information Security Models and Architecture
5. To 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, SecurityPrograms, 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 Assignmentand Seminars.

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level
CO-1	Know the basic concepts of Computer	K1
CO-2	Understand the usage of the Computer and its Security issues	K2
CO-3	Know the impacts of Hacking and explain the methods to improve the security.	K3
CO-4	Analyze security programs and apply it to the suitable security issues	K4
CO-5	Evaluate the security issues in the real world and apply the suitable solution for them.	K5

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate)

PRESCRIBED TEXT BOOKS

1. Fundamentals of Information Technology, Alexis Leon And Mathews Leon, Vikas Publishing HousePvt. 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.

WEB REFERENCE

1. https://www.eccouncil.org/ethical-hacking/
2. https://www.synopsys.com/glossary/what-is-ethical-hacking.html
3. https://www.simplilearn.com/tutorials/cyber-security-tutorial/what-is-ethical-hacking
4. https://www.techtarget.com/searchsecurity/definition/ethical-hacker
5. https://www.comptia.org/content/articles/what-is-ethical-hacking

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

PO–CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	H	H	M	H	H	H	H	H
CO-2	H	H	H	M	H	H	H	H	H
CO-3	H	H	H	M	H	H	H	H	H
CO-4	H	H	H	M	H	H	H	H	H
CO-5	H	H	H	M	H	M	H	H	H

PSO–CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted from the academic year 2021-22 onwards)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA
Second Year - Semester – IV

Course Title	NON MAJOR ELECTIVE -2 - DIGITAL ART LAB
Code	U21CA4NMP02
Course Type	Practical
Semester	IV
Hours/Week	3
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

Learner will be able to

1. To understand the techniques of Krita.
2. To learn visual art elements of line, shape, color and texture.
3. To understand layer masks, filters and blending modes, share and save the images in various formats.
4. To learn various brushes for color management.
5. To understand vector tools for non-destructive editing ofobject

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.

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level
CO-1	Recall the basic concepts of Krita.	K1
CO-2	Demonstrate the visual art elements of line, shape, color and texture.	K2
CO-3	Apply layer masks, filters and blending modes.	K3
CO-4	Develop various brushes for color management.	K4
CO-5	Evaluate vector tools for non-destructive editing of objects.	K5

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)

PO–CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	M	H	H	H	L	M	M	M
CO-2	M	M	H	H	H	L	M	M	M
CO-3	M	M	H	H	H	L	M	M	M
CO-4	H	H	H	H	H	L	H	H	H
CO-5	H	H	H	H	H	L	H	H	H

PSO–CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	M	M	M
CO-3	M	M	M
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted from June 2021-2022 onwards)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK(LOCF)
B.COM. CA - Second Year - Semester – IV

Course Title	**RELATIONAL DATABASE MANAGEMENT SYSTEM**
Code	**U21CA4ALT06**
Course Type	**Theory**
Semester	**IV**
Hours/Week	**4**
Credits	**2**
Marks	**100**

CONSPECTUS

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

COURSE OBJECTIVES

1. To understand the basic concepts of database systems.
2. To illustrate relational algebra notation to access data from database.
3. To examine and apply normalization techniques to normalize a database.
4. To write simple and complex queries using SQL commands.
5. To apply the concepts of procedural language PL/SQL

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: *Boyce Code NF, 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: **12Hrs**

PROCEDURAL LANGUAGE: Procedural Language- SQL: PL/SQL Block Structure– PL/SQL Tables. Cursor Management Advanced PL/SQL: Opening and Closing a Cursor–Processing Explicit Cursor–Implicit Cursor–Exception Handlers.
Extra Reading/Key Words: ACCESSIBLE_BY clause, PL/Scope, PL/SQL-only data types.

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level
CO-1	Remember the basics of database systems, relational model, normalization, SQL and PLSQL	K1
CO-2	Understand basics of relational model and Normal forms	K2
CO-3	Apply and analyze relational algebra and Normal forms in designing schema	K3
CO-4	Analyze the problem and apply the Sequel language and solve by writing SQL queries and PL/SQL programs	K4
CO-5	Evaluate the given scenario of the real time problems and apply SQL and PL/SQL to solve them.	K5

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate)

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) New Delhi.
   (UNIT III)
2. Ivan Bayross, " **Commercial Application Development Using Oracle Developer 2000**",BPB Publications, New Delhi.
   (UNIT V)

BOOKS FOR REFERENCE

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.

PO–CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	M	H	H	M	M	M	M	M
CO-2	M	M	H	H	M	M	M	M	M
CO-3	H	H	H	H	H	M	H	H	H
CO-4	H	H	H	H	H	M	H	H	H
CO-5	H	H	H	H	H	M	H	H	H

PSO–CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted from the academic year 2021-22onwards)

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

Course Title	ALLIED – 5 : PROGRAMMING IN C (PHYSICS)
Code	U21CA4ALT07
Course Type	Theory
Semester	IV
Hours/Week	4
Credits	2
Marks	100

CONSPECTUS

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

COURSE OBJECTIVES

The learner will be able to

1. To understand the concepts of algorithms and flowcharts to solve problems using computer
2. To understand the basic concepts of C Programming
3. To apply and analyze different forms of decision making with if statements to develop C programs effectively
4. To analyze and evaluate the different types of looping constructs and arrays to solve problems
5. To understand the concepts of strings, user defined functions, structures, union, pointers and files in C

UNIT I **12 Hrs**

INTRODUCTION TO COMPUTER PROBLEM SOLVING: Introduction: Steps involved in Problem Solving Using Computers – Algorithms – Flow Charts – Pseudo code – Evolution of Programming Languages: Introduction – Classification of Programming Languages - Compiler – Interpreter, Loader and Linker.

Extra Reading/Keywords: *Develop Algorithms for real time applications.*

UNIT II **12 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/Keywords: *Operators in python.*

UNIT III **12 Hrs**

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/Keywords: *Develop programs using decision making and branching statement.*

UNIT IV **12 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/Keywords: *Develop programs using arrays.*

UNIT V **12 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/Keywords: *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	Cognitive Level
CO-1	Define Algorithm, Flowchart and the basic concepts of the C Program.	K1
CO-2	Classify the various types of operators and statements such as Sequential, Conditional and Decision Making; and Discuss the concepts of Constants, Variables, Keywords and Data types;	K2
CO-3	Compare the various forms of If statements, Looping statement, Arrays and Functions.	K3
CO-4	Analyze the various constructs and use appropriate statement to solve the problem using C effectively	K4
CO-5	Evaluate the performance of the C Program for the given scenario using the various constructs of C Language.	K5

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate)

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. Brian W. 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.

PO–COMAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	M	M	M	L	H	H	M
CO-2	M	M	M	M	M	L	H	H	M
CO-3	H	H	H	M	M	H	H	H	H
CO-4	H	H	H	H	H	H	H	H	H
CO-5	H	H	H	H	H	H	H	H	H

PSO–COMAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	L
CO-5	H	H	L

(For Candidates admitted from the academic year 2021-22onwards)

HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002

SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES

PG DEPARTMENT OF COMPUTER APPLICATIONS

CHOICE BASED CREDIT SYSTEM

LEARNINGOUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

B.Sc. Physics - Second Year - Semester – IV

Course Title	**ALLIED – 6 : PROGRAMMING IN C LAB (PHYSICS)**
Code	**U21CA4ALP08**
Course Type	**Practical**
Semester	**IV**
Hours/Week	**4**
Credits	**2**
Marks	**100**

CONSPECTUS

To write code and develop application programs using C for solving real time problems.

COURSE OBJECTIVES

1. To understand the use of constants, variables, data types, operators, syntax of different statements, strings, user defined functions, structures, union, pointers and files in developing C program
2. To apply the basic concepts in developing C Programming
3. To analyze different forms of decision making with if statements to develop C programs effectively
4. To evaluate the different types of looping constructs and arrays to solve problems
5. Tounderstandtheconceptsofstrings,userdefinedfunctions,structures,union, pointers and files in C

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.

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level
CO-1	Recall the fundamental concepts of C using Simple Programs	K1
CO-2	Develop a simple program using the operators, arrays.	K2
CO-3	Apply the basic concepts to develop C Programs	K3
CO-4	Analyse the different forms of decision-making using C Programs	K4
CO-5	Evaluate the different types of looping constructs using C programs	K5

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate)

PO–CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	H	H	H	H	M	H	H	M
CO-2	H	H	H	H	H	M	H	H	M
CO-3	H	H	H	H	H	H	H	H	H
CO-4	H	H	H	H	H	H	H	H	H
CO-5	H	H	H	H	H	H	H	H	H

PSO– CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	L
CO-5	H	H	L

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
B.C.A. - Third Year - Semester – V

Course Title	Major Core -11 : Software Engineering Concepts
Code	U21CA5MCT11
Course Type	Theory
Semester	V
Hours/Week	4
Credits	4
Marks	100

CONSPECTUS

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

COURSE OBJECTIVES

1. Understand the basic concepts of software engineering and software development life cycle models.
2. Demonstrate the concepts of software project management and requirement analysis and specification
3. Learn the various methods of software design including function-oriented design
4. Analyze the various software testing methods
5. Describe software quality maintenance process models

UNIT I **12 Hrs**

INTRODUCTION: Evolution: From an art form to 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.

Extra Reading /Key words: *Additional Process Models.*

UNIT II **12 Hrs**

SOFTWARE PROJECT MANAGEMENT: software project management complexities- Responsibilities of a Software Project Manager– Project Planning – Metrics for Project Size Estimation – Project Estimation Techniques-Empirical estimation techniques -– COCOMO - A Heuristic Estimation Technique.

REQUIREMENTS ANALYSIS AND SPECIFICATION: Requirements Gathering and Analysis – Software Requirements Specification (SRS) – Formal System Specification.

Extra Reading /Key words: *Other design techniques.*

UNIT III **12 Hrs**

SOFTWARE DESIGN : overview of design process- Characteristics of a Good Software Design – Cohesion and Coupling- Layered Arrangement of modules- – Approaches to Software Design.

FUNCTION-ORIENTED SOFTWARE DESIGN : Overview of SA/SD Methodology – Structured Analysis – Developing the DFD model as a System – Structured Design - Detailed Design – Design Overview

Extra Reading /Key words: *Other architectural designs.*

UNIT IV **12 Hrs**

CODING AND TESTING: Coding – Code Review – software documentation-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.

SOFTWARE MAINTENANCE: Characteristics of Software Maintenance-software reverse engineering-software maintenance process models- Estimation of maintenance cost

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

Course Outcomes:

The Learners

CO No.	Course Outcomes	Cognitive Level (K1 – K6)
CO-1	Recall and compare the various Software Life Cycle Models and Project Estimation Techniques.	K1
CO-2	Explain the Specifications of Requirements Analysis and Software design.	K2
CO-3	Illustrate the concepts of Function-Oriented Software Design	K3
CO-4	Explore Coding And Testing.	K4
CO-5	Acquire the knowledge of Software Maintenance And Software Reuse	K5
CO-6	Acquire the knowledge of working principles in developing good software.	K6

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)
CO – Course Outcomes

TEXT BOOK

1.Rajib Mall, **" Fundamentals of Software Engineering"**, Prentice Hall of India Private Limited, 5th Ed., 2018.

Unit I: Chapter 1: (1.1-1.6), Chapter 2: (2.1-2.3,2.5)
Unit II: Chapter 3(3.1-3.7), Chapter 4: (4.1-4.3)
Unit III: Chapter 5(5.1-5.5), Chapter 6(6.1-6.6)
Unit IV: Chapter 10 (10.1-10.10,10.12)
Unit V: Chapter 11(11.1,11.3-11.6), chapter 13(13.1-13.4)

SUGGESTED READINGS

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.

PO–CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	M	H	H	H	L	M	M	M
CO-2	H	H	H	H	H	M	H	H	H
CO-3	H	H	H	H	H	M	H	H	H
CO-4	H	H	H	H	H	H	H	H	H
CO-5	H	H	H	H	H	H	H	H	H
CO-6	H	H	H	H	H	H	H	H	H

PSO–CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H
CO-6	H	H	H

(For Candidates admitted in the academic year 2021-22)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
Third Year - Semester – V

Course Title	Major Core : 12 Cloud Computing
Code	U21CA5MCT12
Course Type	Theory
Semester	V
Hours/Week	4
Credits	4
Marks	100

CONSPECTUS
To impart the Basic Concepts of Cloud Computing and understand the Technologies and Architectures of Cloud Computing.

COURSE OBJECTIVES:
1. To explain the fundamental of Cloud Computing Concept and Models.
2. To describe the various basic concepts related to Cloud Computing Mechanisms
3. To explain the various Security Threats and Mechanisms
4. To explain the architecture and concept of different cloud models: IaaS, PaaS, SaaS.
5. To apply the application development and deployment models using cloud platforms.

UNIT I : FUNDAMENTAL CLOUD COMPUTING 12Hrs
UNDERSTANDING CLOUD COMPUTING: Origins And Influences - Basic Concepts And Terminology
- Goals And Benefits. **FUNDAMENTAL CONCEPTS AND MODELS:** Roles And Boundaries – Cloud Characteristics - Cloud Delivery Models - Cloud Deployment Models.
Extra Reading /Key words: *Cloud Enabling Technology.*

UNIT II : CLOUD COMPUTING MECHANISMS 12Hrs
CLOUD INFRASTRUCTURE MECHANISMS: Logical Network Perimeter – Virtual Server – Cloud Storage Device – Cloud Usage Monitor. **SPECIALIZED CLOUD MECHANISMS:** Automated Scaling Listener – Load Balancer – SLA Monitor – Pay-Per Use Monitor – Audit Monitor – Failover System.
Extra Reading /Key words: *Multi Device Broker*

UNIT III : CLOUD SECURITY 12Hrs
FUNDAMENTAL CLOUD SECURITY: Basic Terms and Concepts-Threat Agents - Cloud Security Threats.
CLOUD SECURITY MECHANISMS: Encryption -Hashing- Digital Signature – Public Key Infrastructure- Identity and Access Management – Single Sign On – Cloud Based Security Groups – Hardened Virtual Server Images.
Extra Reading /Key words: *Security Policy Disparity.*

UNIT IV : CLOUD COMPUTING ARCHITECTURES **12Hrs**

FUNDAMENTAL CLOUD ARCHITECTURES: Workload Distribution Architecture – Resource Pooling Architecture – Dynamic Scalability Architecture – Elastic Resource Capacity Architecture – Service Load Balancing Architecture – Cloud Bursting Architecture – Elastic Disk Provisioning Architecture. **ADVANCED CLOUD ARCHITECTURES:** Hypervisor Clustering Architecture – Load Balanced Virtual Server Instances Architecture – Cloud Balancing Architecture.

Extra Reading /Key words: *Cloud virtualization*

UNIT V : WORKING WITH CLOUDS **12Hrs**

CLOUD DELIVERY MODEL CONSIDERATIONS : Cloud Provider Perspective Of Cloud Delivery Models: Building IaaS Environments – Equipping PaaS Environments – Optimizing SaaS Environments - Cloud Consumer Perspective Of Cloud Delivery Models: Working With IaaS Environments – Working With PaaS Environments – Working With SaaS Services.

CASE STUDY BACKGROUND : ATN – DTGOV – Innovartus Technologies Inc

Extra Reading /Key words: *Cost Metrics and Pricing Models*

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

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO-1	Discuss the various basic concepts related to cloud computing technologies	**K1**
CO-2	Know and Describe the Infrastructure oriented mechanisms.	**K2**
CO-3	Explain major security and privacy problems in the cloud and how they are addressed with the security mechanisms.	**K3**
CO-4	Examine the cloud architectures	**K4**
CO-5	Evaluate the functionalities of various cloud models: IaaS, PaaS, SaaS	**K5**
CO-6	Design the different working model of cloud computing	**K6**

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)

CO – Course Outcomes

TEXT BOOK

1. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, **"Cloud Computing : Concepts, Technologyand Architecture"**, Prentice Hall, U.S.A., 2013.

UNIT I : Chapters 3 (3.1 – 3.3) ,4
UNIT II : Chapters 7 (7.1 – 7.4) & 8 (8.1 – 8.6)
UNIT III : Chapters 6 (6.1-6.3) & 10
UNIT IV : Chapters 11(11.1-11.7) & 12 (12.1, 12.2, 12.5)
UNIT V : Chapters 14, 2

SUGGESTED READINGS

1. Mehul Mahrishi Kamal Kant Hiran, Ruchi Doshi, Dr. Fagbola Temitayo, "**Cloud Computing**", BPB Publications, First Edition, 2019.
2. Sanjiva Shankar Dubey, **"Cloud Computing and Beyond : A Managerial Perspective"**, Wiley Publications, 2019.

3. Dr. Kumar Saurabh, "**Cloud Computing – Architecturing Next-Gen Transformations Paradigm**", Fourth Edition, Wiley Publications, 2017.
4. Prasanta Pattnaik, Manas Kabat, **"Fundamentals of Cloud Computing"**, S.Chand (G/L) & Company Ltd, First Edition (2014).
5. Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Dr. Deven Shah, **"Cloud Computing – Black Book"**, Dream Tech Publications, 2014

PO–CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	H	H	M	M	H	H	H	H
CO-2	H	H	M	M	M	M	H	H	H
CO-3	H	H	H	M	M	H	H	H	H
CO-4	H	H	H	M	M	M	H	H	H
CO-5	H	H	H	H	H	H	H	H	H
CO-6	H	H	H	H	H	H	H	H	H

PSO–CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H
CO-6	H	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
B.C.A. - Third Year - Semester – V

Course Title	Major Core 13 – Computer Networks
Code	U21CA5MCT13
Course Type	Theory
Semester	V
Hours/Week	4
Credits	4
Marks	100

CONSPECTUS

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

COURSE OBJECTIVES

1. To remember and understand the basic organizations and protocols standards
2. To understand the types of Transmission Media and remembers the data link control
3. To understand the general techniques of Error control, Flow control in Data Link Protocols.
4. To analyze the Routing Algorithms in Network Layer; remember the underlying protocol in Transport Layer.
5. To remember the various services of Application Layer; analyze the various techniques in cryptography.
6. To evaluate the protocols, cryptographic key types, error detection methods, and protocols depends upon the scenario and network resources

UNIT I : OVERVIEW 12 Hrs

Data Communications **–N**etworks - 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 : PHYSICAL LAYER AND MEDIA 12 Hrs

Transmission Impairment Performance. ***Transmission Media***: Guided Media–Unguided Media. ***Data Link Layer*****:** Types of Errors Redundancy – Detection versus Correction – Block Coding. ***DataLink Control***: Framing Flow and Error Control – Protocols

Extra Reading/Keywords*:* *Mobile Telephone System.*

UNIT III : NETWORK LAYER 12 Hrs

IPv4 Addresses- IPv6 Addresses- Unicast Routing Precools–Multicast Routing Protocols

Extra Reading/Keywords: *Internet Routing Protocols*

UNIT IV : TRANSPORT LAYER **12 Hrs**

Process-to-Process Delivery – User Datagram Protocol - TCP -Congestion - Congestion Control and Qualityof Service: Congestion Control - Quality of Service.

Extra Reading/Keywords: *Quality of Service (QoS)*

UNIT V : APPLICATION LAYER **12 Hrs**

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 Learner

CO No.	Course Outcomes	Cognitive Level (K1 – K6)
CO -1	Explain the fundamental knowledge in different network layer models	K1
CO -2	Describe about the types of Transmission Media and understands the data link controls	K2
CO – 3	Relate and illustrate the techniques of Error Detection and Correction, IPv4 Addresses and IPv6 Addresses.	K3
CO – 4	Express the Elementary Data Link Protocols.	K4
CO – 5	Illustrate and analyse the Routing Algorithms in Network Layer; explain the functions of Transport Layer.	K5
CO – 6	Evaluate the functionality of Application Layer in real time applications services.	K6

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)
CO – Course Outcomes

TEXT BOOK

1. Behrouz A. Forouzan, "Data Communications and Networking", Tata McGraw Hill Publications,4thEd.,NewDelhi,2015.

SUGGESTED READINGS

1. Black Uyless D., **"Data Communication and Distributed Networks",** 2000, Prentice Hallof India Pvt. Ltd., New Delhi.
2. ForouzanBehrouz A., **"Local Area Networks"**, 2003, Tata McGraw Hill PublishingLimited, New Delhi.
3. GodboleAchyut S., **"Data Communication and Networks"**, 2002, Tata McGraw HillPublishing 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

PO – CO MAPPING

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	H	H	H	M	H	M	H	L	M
CO 2	H	L	M	M	M	L	M	H	H
CO 3	H	H	H	H	L	M	M	H	H
CO 4	M	M	H	H	M	H	H	L	M
CO 5	M	M	H	H	L	M	H	M	H
CO 6	M	S	M	M	M	H	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO - 1	H	M	L
CO - 2	H	M	M
CO - 3	H	M	L
CO - 4	H	M	L
CO - 5	H	M	L
CO - 6	H	H	H

(For Candidates admitted in the academic year 2021-2022)

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

Course Title	Major Core 14 – Object-Oriented Programming Using C# and .Net
Code	U21CA5MCT14
Course Type	Theory
Semester	V
Hours/Week	4
Credits	4
Marks	100

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

COURSE OBJECTIVES
1. To understand the .NET FRAMEWORK fundamentals
2. To comprehend the Windows controls used with C# Programming aspects
3. To explain & depict the Windows application development in .NET with C# programming
4. To apply and analyze the web application development with web services
5. To comprehend the .NET Framework components related with database objects
6. To Create Database Applications using ADO.NET

UNIT I: **12 Hrs**

Overview of .NET Framework: .NET Framework Architecture - .NET Features – The Common Language Runtime – The .NET Framework Class Library – The Common Type System – Visual Studio .NET IDE 2005 – Windows Programming Fundamentals.
Windows Controls – Category 1: Control Class – Text Boxes – Rich Text Boxes – Labels - Link Labels – Buttons.
Extra Reading/ Keywords: *Microsoft Visual Studio Environment*

UNIT II: **12 Hrs**

Windows Controls – Category 2: Check Boxes – Radio Buttons – Panels – Group Boxes – List Boxes – Checked List Boxes – Combo Boxes.
Extra Reading/ Keywords: *Win GUI Controls used with multiple applications*

UNIT III: **12 Hrs**

Windows Controls – Category 3: Picture Boxes – Scroll Bars – Splitters – Track Bars – Pickers – Notify Icons – Tool Tips – Timers.

Extra Reading/ Keywords: *GUI applications with Windows control categories*

UNIT IV: **12 Hrs**

Windows Controls – Category 4: MenuStrip – Dialog Boxes – Image Lists – Tree Views – List Views – Tool Bars – Status Bars – Progress Bars.

Extra Reading/ Keywords: *Multiple Integrated Web page applications*

UNIT V: **12 Hrs**

Data Access with ADO.NET: ADO.NET Architecture – Advantages – ADO.NET Objects. **Handling Databases in Code:** Connection Class – Command Class – DataAdapter – The DataSet Class – Data Reader Class – DataTable Class – DataRow Class – DataColumn Class – DataRelation Class

Extra Reading/ Keywords: *Case Studies with Front and Back ends in Microsoft Visual Studio setting*

Course Outcomes:
The Learners

CO No.	COURSE OUTCOMES	Cognitive Level (K1-K6)
CO-1	Realizes the .NET FRAMEWORK fundamentals	K1
CO-2	Comprehends the Windows controls used with C# Programming aspects	K2
CO-3	Explicates the Windows application development in .NETwith C# programming	K3
CO-4	Applies and analyzes the GUI application development	K4
CO-5	Exemplifies the windows controls related with database objects	K5
CO - 6	Creates Databases and manipulates the data using ADO.NET Architecture	K6

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)
CO – Course Outcomes

TEXT BOOK

1. Programming with C#.NET, J.G.R. Sathiaseelan, N. Sasikaladevi, PHI Learning Private Limited, New Delhi

UNIT I: Chapter 1, 3
UNIT II: Chapter 4
UNIT III: Chapter 5
UNIT IV: Chapter 6
UNIT V: Chapter 8, 9

SUGGESTED READINGS

1. Herbert Schildt, **"The Complete Reference: C# 4.0"**, Tata McGraw Hill, 2012
2. Christian Nagel et al. **"Professional C# 2012 with .NET 4.5"**, Wiley India, 2012
3. Dan Clark, **"Beginning C# Object Oriented Programming"**, 1st Edition, APRESS, 2011
4. Andrew Troelsen , **"Pro C# 2010 and the .NET 4 Platform"**, Fifth edition, A Press, 2010
5. Ian Griffiths, et. al, **"Programming C# 4.0",** Sixth Edition, O"Reilly, 2010

CO - PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	L	L	L	M	L	M	H	H	H
CO-2	M	M	L	M	L	M	H	H	H
CO-3	H	H	M	M	L	H	H	H	H
CO-4	H	H	H	H	M	H	H	H	H
CO-5	H	H	H	M	H	M	M	H	H
CO-6	H	H	H	M	H	H	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	L	L	L
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H
CO-6	H	H	H

(For Candidates admitted in the academic year 2021-2022)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002

SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES

PG DEPARTMENT OF COMPUTER APPLICATIONS

CHOICE BASED CREDIT SYSTEM

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

B.C.A. - Third Year - Semester – V

Course Title	Major Core 15 - Object-Oriented Programming Using C# and .Net – Lab
Code	U21CA5MCP15
Course Type	Practical
Semester	V
Hours/Week	4
Credits	3
Marks	100

CONSPECTUS

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

COURSE OBJECTIVES

1. To understand the various programming structures with relevant OOP in C#
2. To identify and Demonstrate the OOPs concepts with C# programs
3. To illustrate the Billing Process in Real Time Applications
4. To explain &depict the Windows application development in .NET with C# Programming
5. To apply and analyze the applications with back end connectivity through ADO.NET structures
6. To 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

COURSE OUTCOMES

The Learner

CO No.	Course Outcomes	Cognitive Level (K1 – K6)
CO -1	Depict the different types of programming structures with relevant OOPs concept in C#	K1
CO – 2	Demonstrate the OOPs concepts with C# programs	K2
CO – 3	Illustrate the Billing Process in Real Time Applications	K3
CO – 4	Apply the Windows application development in .NET with C# Programming	K4
CO – 5	Apply and analyze the applications with back end connectivity through ADO.NET structures	K5
CO – 6	Develop C# application programs with components related with database objects through ADO.NET connectivity	K6

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)
CO – Course Outcomes

PO – CO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	H	H	H	M	H	M	H	H	H
CO 2	H	H	M	M	M	H	H	H	H
CO 3	H	H	H	H	H	M	H	H	H
CO 4	M	M	H	H	M	H	H	H	H
CO 5	M	M	H	H	H	H	H	H	H
CO 6	M	H	H	H	H	H	H	H	H

PSO – CO Mapping

CO/PSO	PSO1	PSO2	PSO3
CO - 1	L	L	L
CO - 2	M	M	M
CO - 3	H	H	H
CO - 4	H	H	H
CO - 5	H	H	H
CO - 6	H	H	H

(For Candidates admitted in the academic year 2021-2022)

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

Course Title	Major Elective 3 - Fundamentals of Data Science
Code	U21CA5MET05
Course Type	Theory
Semester	V
Hours/Week	4
Credits	3
Marks	100

CONSPECTUS

This course provides an insight into the fundamental aspects of Data science process and Hadoop framework

COURSE OBJECTIVES

1. To introduce the concepts, techniques and tools in Data Science.
2. To understand the various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modelling, descriptive modelling and effective communication.
3. To apply the machine learning algorithms in Hadoop framework.
4. To understand the various features in Hadoop.
5. To apply the techniques in various scenarios.
6. Implement the Hadoop framework for real time problems.

UNIT I: **12 Hrs**

Introduction: Benefits and uses – Facets of data - **The Data Science Process:** Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building - Data Visualization. Big data ecosystem and data science.

Extra Reading/Keywords: *Statistical Analysis, Strategy making.*

UNIT II: **12 Hrs**

Algorithms: Machine learning algorithms – Modelling process – Types – Supervised – Unsupervised -Semi-supervised.

Extra Reading/Keywords: *Artificial Intelligence, Business Intelligence.*

UNIT III: **12 Hrs**

Introduction to Hadoop: Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types.

Extra Reading/Keywords: *Exploration, Synthesis.*

UNIT IV: **12 Hrs**

Visualizing Data: Exploratory Data Analysis – Developing the visual aesthetic – chart types – Great visualizations – Reading graphs – Interactive visualizations.

Extra Reading/Keywords*: Exploration, Synthesis.*

UNIT V: **12 Hrs**

Data Science – Recent Trends: Applications of Data Science, recent trends in various data collection and analysis techniques, various visualization techniques, application development methods used in data science.

Extra Reading/Keywords: *Automated Machine Learning, Digital Twins.*

Course Outcomes:
The Learners will be able to

CO No.	COURSE OUTCOMES	Cognitive Level
CO-1	Understand the data science process, and Big data ecosystem.	K1
CO-2	Apply data visualization techniques in data science.	K2
CO-3	Analyze the various machine learning algorithms.	K3
CO-4	Evaluate the tools and methods for analyzing the data.	K4
CO-5	Investigate the recent potential applications and development of data science with real time case studies.	K5
CO-6	Present results using data visualization techniques.	K6

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)
CO – Course Outcomes

TEXT BOOKS

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning publications 2016.
2. Doing Data Science**,** Straight Talk from the Frontline**, Cathy O'Neil and Rachel Schutt, O'Reilly,** 2014.
3. Skiena, Steven S. The data science design manual. Springer, 2017.

SUGGESTED READINGS

1. Hadrien Jean Education, C. (2023). Data Science. Certybox Education.
2. Pierson, Lillian. Data science for dummies. John Wiley & Sons, 2021.
3. Grus, Joel. Data science from scratch: first principles with python. O'Reilly Media, 2019.
4. Blum, Avrim, John Hopcroft, and Ravindran Kannan. Foundations of data science. Cambridge University Press, 2020.
5. Jojo Moolayil, "Smarter Decisions: The Intersection of IoT and Data Science", PACKT, 2016.

CO - PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	L	L	L	L	M	H	H	H
CO-2	L	M	L	L	M	L	H	H	H
CO-3	H	H	M	M	H	H	H	H	H
CO-4	H	H	H	H	M	H	H	H	H
CO-5	H	H	H	M	H	M	M	H	H
CO-6	H	H	H	M	H	H	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	L	L	M
CO-2	H	M	H
CO-3	H	M	H
CO-4	M	M	H
CO-5	M	H	H
CO-6	M	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
B.C.A. - Third Year - Semester – V

Course Title	Major Elective 3 - Digital Marketing
Code	U21CA5MET06
Course Type	Theory
Semester	V
Hrs/Week	4 Hrs /Wk
Credits	3
Marks	100

CONSPECTUS

To understand and explore the various digital marketing strategies and platforms.

COURSE OBJECTIVES

1. To understand the fundamentals of digital marketing and search engine optimization
2. To identify the various pay per clicks and Digital Display Ads.
3. To analyze the strategies of E-mail marketing and Mobile marketing.
4. To distinguish various social media marketing and ways of implementation.
5. To demonstrate the four stages of strategy and planning process.

UNIT-I INTRODUCTION AND SEO 12 HRS

Introduction to Digital Marketing - Search Engine Optimization: Introduction - Search Engine Result Pages – Search Behavior – Goals - On Page Optimization - Off Page Optimization – Analyze.

Extra Reading/Keywords: *Online Marketing*

UNIT-II PAY PER CLICK AND DIGITAL DISPLAY ADVERTISING 12 HRS

Introduction –goals - Setup. **Digital Display Advertising**: Introduction - Display Advertising – stages.

Extra Reading/Keywords: *CTR, CPA, CPC*

UNIT-III EMAIL MARKETING AND MOBILE MARKETING 12 HRS

Introduction – Data and Email Marketing process - Design and content – Delivery – Discovery: Report and analysis. - **Mobile Marketing:** Introduction – Opportunity – Optimize.

Extra Reading/Keywords*:* *Marketing Mix*

UNIT-IV SOCIAL MEDIA MARKETING 12 HRS

Introduction – Goals - Channels: Facebook – Twitter – LinkedIn - Google+ - YouTube – Blogs – Overview of Instagram - Implementation.

Extra Reading/Keywords*:* *Network Marketing*

UNIT-V STRATEGY AND PLANNING 12 HRS

Introduction – Approach - Audience – Activities - Analysis.

Extra Reading/Keywords*:* *B2B, Marketing*

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

COURSE OUTCOMES

CO No.	Course Outcomes	Cognitive Level (K1-K6)
CO-1	Recognize the importance of digital marketing and search engine optimization	K1
CO-2	Identify the various digital platform used to achieve marketing goals	K2
CO-3	Apply different stages of digital display advertising to implement marketing strategies using digital platform.	K3
CO-4	Examine the digital marketing platform suitable for performing marketing strategies and plan in real-time scenario.	K4
CO-5	Evaluate the digital platform that provides secured and effective method to accomplish the strategy of digital marketing	K5
CO-6	Create a new digital display advertising and implement it in marketing	K6

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)
CO – Course Outcomes

TEXT BOOKS

Dodson Ian, (2016).The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns. Wiley.

Unit I: Chapter-1, 2
Unit II: Chapter-3, 4
Unit III: Chapter-5, 8
Unit IV: Chapters 6, 7
Unit V: Chapters 10

SUGGESTED READINGS

1. Ahuja Vandana, (2016). Digital marketing. Oxford University Press.
2. Ryan Damian, (2016). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation. Kogan Page Limited.
3. Shah, Kruti and D'Souza, Alan (2014). Advertisement and Promotion: An IMC Perspective. McGraw Hill Education.
4. Baack, E. Donald and Clow, E. Kenneth. (2014). Integrated Advertising, Promotion and Marketing Communications. Pearson Education.
5. Nag, A. (2013).Sales and Distribution Management. McGraw-Hill Education

WEB REFERENCES

1. https://digitalfireflymarketing.com/wp-content/uploads/2017/02/Big-Book-of-Digital-Marketing.pdf
2. https://www.7boats.com/academy/wp-content/uploads/2016/10/50-shades-of-digital-marketing.pdf
3. https://webmarketingacademy.in/wp-content/uploads/2015/09/A-Step-By-Step-Guide-to-Modern-Digital-Marketing.pdf
4. https://www.lyfemarketing.com/blog/wp-content/uploads/2017/12/Digital-Marketing-Strategy-eBook.pdf
5. http://netmining.com/wp-content/uploads/2015/09/Netmining-Marketing-Big-Book.pdf

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

CO - PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	L	M	L	L	H	H	M
CO-2	H	M	L	M	L	L	H	H	M
CO-3	H	M	H	H	H	M	H	H	H
CO-4	H	H	H	H	H	M	H	H	H
CO-5	H	H	H	H	H	M	H	H	H
CO-6	H	H	H	H	H	M	H	H	H

PSO–CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H
CO-6	H	H	H

(For Candidates admitted in the academic year 2021-2022)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-620002
SCHOOL OF MATHEMATICAL COMPUTATIONSCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASEDCREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
B.Com.CA - Third Year - Semester – V

Course Title	Major Elective - 3 : Introduction to Python Programming
Code	U21CA5MEP04
Course Type	Practical
Semester	V
Hours/Week	4
Credits	3
Marks	100

CONSPECTUS

To provide comprehend basic Python programming concepts and develop programming solutions for small problems.

COURSE OBJECTIVES

1. Learn the syntax and semantics of Python programming language; understand the necessity and importance of Lists, Dictionaries and Tuples
2. Understand and relate the Functions and Modules to facilitate code reuse
3. Express the different Decision Making and Looping statements
4. Understand and study the Data visualization with different Charts
5. Understand on Arrays and Matrices to perform a number of mathematical Operations
6. Apply the Data Visualization Tools to analyse and depict graphical representation

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

Visualization 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	Cognitive Level
CO-1	Interpret the basic principles of Python programming language; to create and manipulate lists, tuples and Dictionaries	K1
CO-2	Implement programs using functions and strings.	K2
CO-3	Develop Python programs with conditionals and loops.	K3
CO-4	Illustrate and analyze the data visualization with different Charts	K4
CO-5	Illustrate and interpret the concepts of arrays and matrices to manipulate and perform mathematical operations	K5
CO - 6	Apply Data Visualization Tools to analyse and represent in Graphs	K6

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)
CO – Course Outcomes

TEXT BOOK

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.

SUGGESTED READINGS

1 Sheetal Taneja, Naveen Kumar**,** "Python Programming A Modular Approach"**,** Pearson,2017.

2. Wesley J Chun, **"Core Python Applications Programming"**, 3rd Edition, PearsonEducation 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

CO-PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	L	L	L	M	L	M	H	H	H
CO-2	M	M	L	M	L	M	H	M	H
CO-3	H	H	M	M	L	H	M	H	M
CO-4	H	H	H	H	M	H	H	M	H
CO-5	H	H	H	M	H	H	L	H	H
CO-6	H	H	M	M	H	H	H	H	H

PSO–CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	L	L	L
CO-2	M	M	M
CO-3	H	H	H
CO-4	M	M	H
CO-5	H	H	H
CO-6	H	H	H

.

(For Candidates admitted from the academic year 2021 -22 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002

SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES

PG DEPARTMENT OF COMPUTER APPLICATIONS

CHOICE BASED CREDIT SYSTEM

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

B.C.A. - Third Year - Semester – V

Course Title	Non Major Elective 3 – Introduction to Smart Technologies
Code	U21CA5NMT03
Course Type	Theory
Semester	V
Hours/Week	3
Credits	3
Marks	100

CONSPECTUS

To gain knowledge on the current smart technologies which makes the world smarter.

COURSE OBJECTIVES

1. To understand the basics of Smart Devices and Smart Connectivity
2. To identify the various wireless technologies and Intelligent Applications
3. To analyze the different Smart Appliances
4. To apply the Smart Technology in automating the home
5. To recognize the various Smart Applications to transform into Smart World

UNIT I **9Hrs**

Introduction to the Internet of Things: Introduction – Understanding Smart Devices - Importance of Internet of Things - Smart Connectivity and You.

Extra Reading/Keywords :*Smart Technologies*

UNIT II **9Hrs**

Understanding the Internet of Things: IOT Architecture- Building the Internet of Things - IOT Connected devices - Understanding Network Connections- Examining Wireless Technologies Understanding the Data - Understanding Intelligent Applications - Understanding Big Data.

Extra Reading/Keywords : *Data Analysis*

UNIT III **9Hrs**

IoT Smart Appliances: Understanding IoT Smart Appliances -Smarter Food Storage with Smart Refrigerators - Smarter Cooking with Smart Ovens - Smarter Cleaning with Smart Dishwashers and Dryers- Smart Appliances and You

Extra Reading/Keywords : *Smart Boards*

UNIT IV **9Hrs**

Smart Homes: Automating the Home - Smart Steps to a Smart Home- Simple Components for a Smart Home - Smart Furniture - Smart Lighting - Smart Windows - Smart Thermostats - Smart Security Systems- Smart Monitors

Extra Reading/Keywords : *Automation of Industries*

UNIT V **9Hrs**

Smart Applications: Smart Cars - Pros and Cons of Autonomous Autos - Navigating the Legal Landscape - Smart Cars and You - Smart Aircraft- **Smart World:** Smart Offices - Smart Stores - Smart Inventory Management.

Extra Reading/Keywords :*Smart City*

COURSE OUTCOMES:

The Learner will be able to :

CO No.	Course Outcomes	Cognitive Level (K1 – K6)
CO - 1	Recall the basics of Smart Technologies	K1
CO - 2	Differentiate various wireless technologies and recognize the Intelligent Applications	K2
CO - 3	Compare the various Smart Appliances	K3
CO - 4	Apply the smart technology in automating a home	K4
CO - 5	Analyze the Smart Applications and Smart World	K5
CO – 6	Create an Application using Smart Devices	K6

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)

CO – Course Outcomes

TEXT BOOK

1. Michael Miller, **"The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World"**, Que Publishing, 2015.

SUGGESTED READINGS

1. ArshdeepBahga and Vijay Madisetti, **"Internet of Things, A Hands on Approach"**, Universities Press, 2015.
2. Pethuru Raj and Anupama C. Raman, **"The Internet of Things Enabling Technologies, Platforms and Use Cases"**, Taylor & Francis, CRC Press, 2017.
3. Yasser Ismail, "**Internet of Things(IoT) for Automated and Smart Applications**", InTech Open Publications, 2019
4. Peter Brida, OndrejKrejcar, All Selamat et al, "**Smart Sensor Technologies for IoT**", MDPI Publications, 2021
5. Ajit Singh, "**Smart Home Automation Using IoT**", Independently Published, 2021.

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	L	L	L	M	L	M	H	H	H
CO-2	M	M	L	M	L	M	H	H	H
CO-3	H	H	M	M	L	H	H	H	H
CO-4	H	H	H	H	M	H	H	H	H
CO-5	H	H	H	M	H	H	H	H	H
CO-6	H	H	M	M	H	H	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	L	L	L
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H
CO-6	H	H	H

(For Candidates admitted in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
B.C.A. - Third Year - Semester – V

Course Title	Major Skill Based Elective - 2: Multimedia - Lab
Code	U21CA5SBP02
Course Type	Practical
Semester	V
Hours/Week	2
Credits	1
Marks	100

CONSPECTUS

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

COURSE OBJECTIVES

1. Demonstrate the techniques of photo editing.
2. Apply layer masks, filters and blending modes, share and save your images in various formats.
3. Learn various retouching and repairing techniques to correct images.
4. Demonstrate the techniques for resize and crop images.
5. Demonstrate how to Remove or repair unwanted image areas.
6. Design and develop creative applications using GIMP.

EXCERCISES:

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.

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitivee Level (K1-K6)
CO 1	Remember the techniques of photo editing.	K1
CO 2	Identify layer masks, filters and blending modes, share and save your images in various formats.	K2
CO 3	Depict various retouching and repairing techniques to correct images.	K3
CO 4	Apply the techniques for resize and crop images.	K4
CO 5	Apply and analyse how to Remove or repair unwanted image areas.	K5
CO 6	Create new Design and develop creative applications using GIMP.	K6

(K1=Remember, K2=Understand, K3=Apply,K4=Analyze,K5=Evaluate,K6=Create)

CO – Course Outcomes

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	H	M	M	H	H	H	H	H
CO-2	M	M	M	M	H	H	H	H	H
CO-3	H	H	H	M	H	H	H	H	H
CO-4	H	H	H	H	M	H	H	H	H
CO-5	H	H	H	M	H	H	H	H	H
CO-6	H	H	M	M	H	H	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	M
CO-2	H	H	M
CO-3	H	H	M
CO-4	H	H	M
CO-5	H	H	M
CO-6	H	H	M

(For Candidates admitted from the academic year 2021-22 onwards)

Course Title	**Major Core-16: OPERATING SYSTEMS**
Code	**U21CA6MCT16**
Course Type	**Theory**
Semester	**VI**
Hours/Week	**4**
Credits	**4**
Marks	**100**

CONSPECTUS

To enable the students to learn the concepts of operating systems and various algorithms involved.

COURSE OBJECTIVES

1. To Remember the structures of Computer system and operating systems
2. To Understand the working process of thread and their types
3. To Analyze the critical section problems and deadlocks
4. To Illustrate the concept of memory management and virtual memory
5. To Discuss the file concepts and its types

UNIT I **12 Hrs**

INTRODUCTION: What is an Operating system- History of operating system- computer hardware review-operating system concepts

SYSTEMS STRUCTURES: Operating System Structures: Operating System Services –System Calls-Types of System Calls-system Program.

Extra Reading/Keywords: *Evolution of Computer System and Types of OS*

UNITII **12Hrs**

PROCESSES: Process Concept–Process Scheduling–Operation on Processes–Inter process Communication. **THREADS:** Overview–Multithreading Models–Threading Issues. **CPUSCHEDULING:** Basic Concepts– Scheduling Criteria–Scheduling Algorithms –Thread Scheduling-Multiple–Processor Scheduling.

Extra Reading /Key words: *Calculating waiting time, turnaround time and response time for all the scheduling Algorithms.*

UNIT III **12 Hrs**

SYNCHRONIZATION: Background-The Critical-Section Problem–Synchronization Hardware–Semaphores. **DEADLOCKS:** System Model–Deadlock Characterization– Methods for Handling Deadlocks– Deadlock Prevention–Deadlock Avoidance–Deadlock Detection– Recovery from Deadlock.

Extra Reading/Keywords: *Real time examples in deadlock.*

UNIT IV **12 Hrs**

MEMORY MANAGEMENT: Background–Swapping–Contiguous Memory Allocation–Paging–Structure of the page table-Segmentation. **VIRTUAL MEMORY**: Background–Demand Paging–Copy on Write– Page Replacement.

Extra Reading/Keywords: *Page fault calculation, Comparison of page replacement algorithm.*

UNIT V **12 Hrs**

FILE-SYSTEMINTERFACE: File Concept–Access Methods–Directory Structure–File System Mounting– File Sharing–Protection. **FILE-SYSTEM IMPLEMENTATION**: File-System Structure – File System Implementation- Directory Implementation–Allocation Methods.

Extra Reading/Keywords: *Comparing the allocation methods, free open OS software*

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-K5)
CO-1	Recall the different structures of operating systems	**K1**
CO-2	Understand the concept of processes, threads and various CPU scheduling algorithms	**K2**
CO-3	Apply the concept of resource allocation graph to find deadlock	**K3**
CO-4	Analyze the memory allocation methods	**K4**
CO-5	Evaluate the page replacement algorithms	**K5**

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze,K5=Evaluate)

TEXT BOOKS

1. Abraham Silbers chatz, Peter Baer Galvin, Greg Gagne, **"Operating System Concepts",** Tenth Edition, John Wiley & Sons Publications Inc., Singapore, 2023
2. Andrew S. Tanenbaum, **" Modern Operating System"**, fourth edition, Pearson Education, 2015

SUGGESTED READINGS

1 William Stallings, **"Operating Systems"**, Pearson Education Publications, Singapore, Nineth edition, 2019.

2 G. Sreehitaha reddy, **"Operating Systems Concepts"** , Notion press, 2019.

3 Dr. Priyanka rathee, **"Basic Principles of an Operating System"** ,BPB publications, 2019.

4 Pramod bhatt, **"An introduction to Operating System"** , Fifth edition, PHI private Ltd., 2019.

5 Charles Crowley, **"Operating system : A design- Oriented approach"**, McGraw Hill Education, 2017.

WEB REFERENCES

1. https://www.geeksforgeeks.org/thread-in-operating-system/
2. https://www.techtarget.com/whatis/definition/operating-system-OS
3. https://www.geeksforgeeks.org/introduction-of-process-synchronization/
4. https://www.javatpoint.com/os-deadlocks-introduction
5. https://www.w3schools.in/operating-system/file-system-interface

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

CO - PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	L	L	L	M	L	M	H	H	H
CO-2	M	M	L	M	L	M	H	H	H
CO-3	H	H	M	M	L	H	H	H	H
CO-4	H	H	H	H	M	H	H	H	H
CO-5	H	H	H	M	H	M	M	H	H

PSO– CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	L	L	L
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted from the academic year 2021-22 onwards)

Course Title	**Major Core - 17 : COMPUTER GRAPHICS**
Code	**U21CA6MCT17**
Course Type	**Theory**
Semester	**VI**
Hours/Week	**4**
Credits	**3**
Marks	**100**

CONSPECTUS:

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

COURSE OBJECTIVES:

1. To 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.
2. To examine the specification of basic geometric structures such as Points, Lines, Circles & curves.
3. Toapplythe various attributes that control the appearance of the displayed Primitives.
4. Toapplytwo dimensional transformations and clipping techniques in 2D scenes.
5. To recognize the three dimensional display methods and compare parallel and perspective projections.

UNIT I **12 Hrs**

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 **12 Hrs**

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 **12 Hrs**

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 **12 Hrs**

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 Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-K5)
CO-1	Acquire the concept of Raster Scan & Random Scan System Architectures with relevant equations of computer graphics	**K1**
CO-2	Understood and analyze the basic graphics algorithms for drawing and clipping the geometric objects.	**K2**
CO-3	Able to recognize the coordinate elements to display graphic images to given specifications	**K3**
CO-4	Describes and applies the standard graphic projections of lines, planes and solids to formnew pictures	**K4**
CO-5	Obtain development of surfaces and filling attributes with geometric object with various projections and Classifies the 2D and 3D views and coordinate systems with graphical techniques	**K5**

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

TEXT BOOK

1. 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)

SUGGESTED READINGS

1. T. Graceshalini A. P. Godse, Dr. D. A. Godse , **"Computer Graphics & Multimedia"**, Technical Publications, 2020.
2. Ronald E. Barr , Davor Juricic , Thomas J. Krueger , **"Engineering & Computer Graphics Workbook Using SOLIDWORKS"**, Beginner Publishers,2017.
3. David Rogers , J. Alan Adams, **"Mathematical Elements for Computer Graphics"**, 2017,
4. Mahesh Goyani, **"Computer Graphics"**, TechKnowledge, 2020
5. Rajiv Choprs, **"Computer Graphics: with an Iintroduction to Multimedia"**, S Chand Publishing, 2015.

WEB REFERENCES

1. https://www.slideshare.net/KamalAcharya/output-primitives-in-computer-graphics
2. https://www.geeksforgeeks.org/introduction-to-computer-graphics/
3. https://www.tutorialspoint.com/computer_graphics/2d_transformation.htm
4. https://www.javatpoint.com/computer-graphics-3d-graphics
5. https://www.cs.cmu.edu/afs/cs/academic/class/15462-s09/www/lec/06/lec06.pdf

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

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	L	L	H	H	L	M	M	M
CO-2	M	L	H	H	H	L	M	H	M
CO-3	H	L	H	H	M	L	M	H	H
CO-4	H	M	H	H	H	H	M	H	H
CO-5	H	M	L	H	H	L	M	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	M	M	M
CO-3	H	H	M
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted from the academic year 2021-22 onwards)

Course Title	Major Core - 18 : INTERNET OF THINGS
Code	U21CA6MCT18
Course Type	Theory
Semester	VI
Hours/Week	4
Credits	3
Marks	100

CONSPECTUS

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

COURSE OBJECTIVES

1. To understand the Internet of computer and Internet of things.
2. To identify the different types of sensors
3. To understand and analyze the architecture in various IoT Layers
4. To analyze various protocols and its usage in communication.
5. To create Program to implement IoT applications

UNIT I **12 Hrs**

INTRODUCTION TO IOT: 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 **12 Hrs**

INTRODUCTION TO SENSORS, MICROCONTROLLERS AND THEIR INTERFACING: Introduction to Sensor Interfacing –Types of Sensors: MQ-02/05 – Gas Sensor Interfacing with Node MCU / 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 **12 Hrs**

PROTOCOLS FOR IOT& CLOUD FOR IOT: PROTOCOLS FOR IOT - MESSAGING AND TRANSPORT: Introduction – Messaging Protocols – XMPP and DDS s – Transport Protocols. **PROTOCOLS FOR IOT - ADDRESSING AND IDENTIFICATION:** Introduction – Internet Protocol Version 4 (IPv4) - Internet Protocol ion 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 **12 Hrs**

IOT PROTOCOLS: The BAC Net 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, DNS*

UNIT V **12 Hrs**

APPLICATIONS OF IOT : 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 Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1 – K5)
CO-1	Recognize and describe the Internet of computer and Internet of Things	K1
CO-2	Classify various types of sensors	K2
CO-3	Identify the different protocols used in different layer.	K3
CO-4	Classify models in IoT Architecture and relate it with real time implementation	K4
CO-5	Express the IoT application in various real time problems	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

TEXT BOOKS

1. Shriram 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: Chapters 3, 4, 5.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, **"The Internet of Things – Key applications and Protocols"**, Wiley India Pvt. Ltd., 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., 2019.
   UNIT V: Chapters 5, 6.

SUGGESTED READINGS

1. Andrew Minteer, **"Analytics for the Internet of Things (IoT): Intelligent analytics for your Intelligent devices"**, Packt Publishing, ISBN-13 978-1787120730, 2017.
2. Pethuru Raj and Anupama C. Raman, **"The Internet of Things Enabling Technologies, Platforms and Use Cases"**, Taylor & Francis, CRC Press, 2017.
3. Anand Thanmboli, **"Build Your Own IoT Platform: Develop a Fully Flexible and Scalable Internet of Things Platform in 24"**, Springer India , ISBN-13 978-1484275177, 2021.
4. Peter Waher, **" Learning Internet of Things"**, Packt Publishing, ISBN-13 978- 1783553532, 2017.
5. Hiroto Yasuura, etl, **"Smart Sensors at the IoT Frontier"**, Springer, ISBN 13- 3319553443, 08 2017.

WEB REFERENCES

1. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/
2. https://nanohub.org/resources/26584/download/Sensors_presentation.pdf
3. https://www.tutorialspoint.com/iot-network-protocols
4. https://www.allaboutcircuits.com/technical-articles/internet-of-things-communication-protocols-iot- data-protocols/
5. https://www.spiceworks.com/tech/iot/articles/top-applications-internet-of-things/

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

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	H	M	M	M	M	L	H	H	M
CO-2	M	M	M	M	M	L	H	H	M
CO-3	H	H	H	M	M	L	H	H	M
CO-4	H	H	H	H	H	L	H	H	H
CO-5	H	H	H	M	H	M	M	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	H	H	H
CO-2	H	L	H
CO-3	H	H	H
CO-4	H	H	L
CO-5	H	H	H

(For Candidates admitted from the academic year 2021-22 onwards)

Course Title	**Major Core - 19 : BIG DATA ANALYTICS**
Code	**U21CA6MCT19**
Course Type	**Theory**
Semester	**VI**
Hours/Week	**4**
Credits	**3**
Marks	**100**

CONSPECTUS

Learn the fundamentals of Big Data Analytics and Map Reduce Fundamentals and know the key concepts of Hadoop framework, Map Reduce with Hive and Pig.

COURSE OBJECTIVES

1. To understand the fundamental concepts of Big data
2. To Analyze the usage and extraction techniques of NoSql, Hadoop, Yarn
3. To Specify the importance of MongoDb and Map reduce
4. To Determine the basic features of Hive.
5. To explain the fundamental features of Big.
6. To Applyand analyze the analytical platform in R.

UNIT I **12 Hrs**

INTRODUCTION TO BIG DATA AND ANALYTICS : 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 **12 Hrs**

INTRODUCTION TO TECHNOLOGY LANDSCAPE : 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 **12 Hrs**

INTRODUCTION TO MONGODB AND MAPREDUCE PROGRAMMING: MONGO DB: Why Mongo DB - Terms used in RDBMS and Mongo DB - Data Types – MongoDB Query Language MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.

Extra Reading/Keywords: *Usage of cloud for Big Data Cloud Market*

UNIT IV **12 Hrs**

INTRODUCTION TO HIVE AND PIG : 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 **12 Hrs**

INTRODUCTION TO DATA ANALYTICS WITH R : 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 Learner will be able to:

CO No.	COURSE OUTCOMES	Cognitive Level (K1-K5)
CO-1	Explains the fundamentals of Big Data and categorizes Big Data and its importance	K1
CO-2	Identifies the classification of Analytics with Top analytical tool	K2
CO-3	Describes the MongoDb Query language with Mapreduce	K3
CO-4	Explore the various datatype and features in Hadoop & MapReduce	K4
CO-5	Summarizes the data analytics in various environments using Machine Learning techniques	K5

(K1=Remember, K2= Understand, K3= Apply, K4 = Analyze, K5 = Evaluate)

TEXT BOOK

1. Seema Acharya, Subhashini Chellappan, **"Big Data and Analytics"**, Wiley Publications, First Edition,2019

SUGGESTED READINGS

1. Raj Kamal, **"Big data Analytics"**, First edition, McGraw hill education limited, 2019.
2. Bharti Motwani, **"Data Analytics using Python"**, Wiley Publications, 2020.
3. G. Sudha Sadasivam, **" Big Data Analytics"**, Oxford University, 2020,
4. Vincius Aquino Do Vale, **"Data Processing and Modeling With Hadoop"**, .BPB publisher ltd, 2021
5. Amandeep Kaur, **"Introduction to Big Data and Analytics"**, Notion press, 2020.

WEB REFERENCES

1. https://www.heavy.ai/learn/big-data-analytics
2. https://hadoop.apache.org/
3. https://www.geeksforgeeks.org/mongodb-an-introduction/
4. https://www.javatpoint.com/pig
5. https://www.tutorialspoint.com/big_data_analytics/r_introduction.htm

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

CO - PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	L	L	L	M	L	M	H	H	H
CO-2	M	M	L	M	L	M	H	H	H
CO-3	H	H	M	M	L	H	H	H	H
CO-4	H	H	H	H	M	H	H	H	H
CO-5	H	H	H	M	H	M	M	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	L	L	L
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted from the academic year 2021-22 onwards)

Course Title	**Major Core – 20: INFORMATION AND CYBER SECURITY**
Code	**U21CA6MCT20**
Course Type	**Theory**
Semester	**VI**
Hours/Week	**4**
Credits	**4**
Marks	**100**

CONSPECTUS

To gain in-depth knowledge in the field of Computer forensics- Cyber Crime & Cyber Laws.

COURSE OBJECTIVES

1. To understand the basics of Cyber Security.
2. To identify the domain of cyber security policy.
3. To analyze cyber security frameworks and security policy.
4. To apply security principles and develop control system.
5. To applycyber securityprotection 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.

CYBERPEACE: Analysis threats – antagonism in cyberspace- Conflict management in Cyberspace-Organizations involved in Cyber peace.

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	Cognitive Level (K1-K5)
CO-1	Recall the basics of cyber security, cyber crimes and security tools to protect the data and software Identify various Analysis threats and antagonism in cyberspace	K1
CO-2	Differentiate various cyber security issues and Evidence Recovery tools	K2
CO-3	Apply suitable cyber law for each cybercrime and suitable security methods to cybercrimes	K3
CO-4	Analyze various Conflict management styles in Cyberspace	K4
CO-5	Evaluate Digital Emotional Intelligence (DEQ)	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

TEXT BOOKS

1. Mark Rhodes-Ousley **"The Complete Reference –Information Security"** McGraw Hill Education Private Limited, Edition 2018.
2. Nina Godbole, Sunit Belapure , **"Cyber Security"**, Wiley India Pvt. Ltd, 2021.

SUGGESTED READINGS

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 CRC Press LLC, 2017.
3. Stuart McClure, Joel Scrambray, George Kurtz, **"Hacking Exposed"**, Tata McGraw- Hill, 2003 Matt Bishop, — Computer Security Art and Science, Pearson/PHI, 2022

WEB REFERENCES

1. https://www.geeksforgeeks.org/what-is-information-security/
2. https://www.tutorialspoint.com/information_security_cyber_law/offences_and_penalties.htm
3. https://www.ibm.com/docs/en/i/7.2?topic=availability-high-overview
4. https://www.javatpoint.com/mobile-communication-introduction
5. https://www.linkedin.com/pulse/cyber-attacks-organizations-challenges-implications-tsaaro

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

CO - PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	L	L	L	M	L	M	H	H	H
CO-2	M	M	L	M	L	M	H	H	H
CO-3	H	H	M	M	L	H	H	H	H
CO-4	H	H	H	H	M	H	H	H	H
CO-5	H	H	H	M	H	M	M	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	L	L	L
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted from the academic year 2021-22 onwards)

Course Title	**Major Elective - 4 : DATA ANALYTICS TOOLS – LAB**
Code	**U21CA6MEP07**
Course Type	**Practical**
Semester	**VI**
Hours/Week	**4**
Credits	**3**
Marks	**100**

CONSPECTUS

To learn the skill of data visualization by understanding, and problematizing how data are generated, analyzed, and used. The students will be able to apply its concepts and skills to visualize the data, interpret the findings, and examine the impacts of data-driven decision.

COURSE OBJECTIVES

1. To learn Python Programming.
2. To perform Data manipulation using Power BI and Tableau.
3. To interpret the Mappings and Workflows of Power BI and Table.
4. To evaluate the performance of the model.
5. To write R programs for data visualization.

EXCERCISES

1. Functions
2. String processing
3. List processing
4. Dictionaries
5. Tuples
6. Data analysis through python
7. Data visualization in Matplotlib, Seaborn and R
8. Create dashboards and generate reports
9. Sharing Dashboards, reports and other apps in different ways
10. Get sample Datasets in Power BI
11. Applythemes in Power BI
12. Apply conditional table formatting in Power BI
13. Identify the ways to publish and share dashboards in Tableau
14. Organize workspaces in Tableau environment
15. Publish a Data Source on the web using Tableau

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1 – K5)
CO -1	Recall the basic concepts of Python , R Programming and how to use Microsoft Power BI and Tableau for data analytics	K1
CO – 2	Understand the analysis methods using R , Python, Microsoft Power BI and Tableau	K2
CO – 3	Apply R, Python, Microsoft Power BI and Tableau for data interpretation, analysis and visualization	K3
CO – 4	Analyze the various visualization, analysis methods through R, Python, Microsoft Power BI and Tableau	K4

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

PO – CO MAPPING

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	H	H	H	M	H	M	H	H	H
CO 2	H	H	M	M	M	H	H	H	H
CO 3	H	H	H	H	H	M	H	H	H
CO 4	M	M	H	H	M	H	H	H	H
CO 5	M	M	H	H	H	H	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO - 1	L	L	L
CO - 2	M	M	M
CO - 3	H	H	H
CO - 4	H	H	H
CO - 5	H	H	H

(For Candidates admitted from the academic year 2021-22 onwards)

Course Title	**Major Elective – 4 : PYTHON PROGRAMMING – LAB**
Code	**U21CA6MEP08**
Course Type	**Practical**
Semester	**VI**
Hours/Week	**4**
Credits	**3**
Marks	**100**

CONSPECTUS

To write code and develop application programs using Python for solving real time problems.

COURSE OBJECTIVES

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Torepresent compound data using Python lists, tuples, and dictionaries
4. To acquire Object-oriented programming skills in Python..
5. To acquire programming skills in core Python.

EXCERCISES

1. Simple Exercises
2. Flow controls, Functions and String Manipulation
3. Operations on Tuples and Lists
4. Operation on sets
5. Operations on Dictionary
6. Simple OOP– Constructors
7. Method Overloading
8. Files – Reading and Writing – perform the basic operation of reading and writing with student file
9. Regular Expressions
10. Modules
11. Packages
12. Exception Handling

COURSE OUTCOMES

The Learner will be able to:

CO No	Course Outcomes	Cognitive Level (K1-K5)
CO-1	Demonstrate the understanding of syntax and semantics of Python Programming	K1
CO-2	Identify the problem and solve using PYTHON programming techniques.	K2
CO-3	Identify suitable programming constructs for problem solving.	K3
CO-4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.	K4
CO-5	Develop a PYTHON programfor a given problem and test for its correctness.	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	L	L	L	L	H	M	H	H	H
CO-2	L	M	H	M	H	M	H	M	H
CO-3	M	H	H	M	H	M	H	M	H
CO-4	M	H	H	M	H	M	H	H	H
CO-5	M	H	H	M	H	M	H	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	H	H	H
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted from the academic year 2021-22 onwards)

Course Title	**Major Elective – 4: RELATIONAL DATABASE MANAGEMENT SYSTEMS-LAB (COMMERCE - CA)**
Code	**U21CA6MEP09**
Course Type	**Practical**
Semester	**VI**
Hours/Week	**4**
Credits	**3**
Marks	**100**

CONSPECTUS

To enable the students to understand the fundamental concepts of Database Management System through the use SQL Commands in the Data Definition and Data Manipulation Languages.

COURSE OBJECTIVES

1. To create Database, Table and insert values using SQL Commands.
2. To understand and apply the concepts of various Built in functions using Queries.
3. To understand and apply the concepts of various Operators using Queries.
4. To write simple and complex queries using Views and SQL commands.
5, To apply the concepts of PL / SQL programs using Cursor, Stored Procedures, Functions and Triggers.

EXERCISES

SQL

1. Table Creation
2. Table Manipulation using Queries
3. Table Manipulation Using Built-In-Functions
4. Table Filter and Manipulation Using Operators
5. View Creation
6. PL / SQL Program using Cursor
7. PL / SQL Program using Stored Procedures
8. PL / SQL Program using Functions
9. PL / SQL Program using Triggers

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1 – K5)
CO-1	Remember the basics of database systems, relational model, and normalization; interpret the basic DDL and DML statements to Create, Alter, and Drop Tables; to Insert, Select, Update and Delete Data.	K1
CO-2	Understand andimplement various Built in functions to Transform Aggregate or Manipulate data within Tables.	K2
CO-3	Apply various Operators to perform operations on data values or columns in SQL queries within Tables.	K3
CO-4	Analyze the problem and apply the SQL Views to Creating and Retrieval data using Views	K4
CO-5	Develop, Evaluate and Analyze the real time problems using Cursor, Stored Procedures, Functions and Triggers PL/SQL programs	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	M	M	H	H	M	-	M	M	M
CO-2	M	M	H	H	M	-	M	M	M
CO-3	H	H	H	H	H	-	H	H	H
CO-4	H	H	H	H	H	-	H	H	H
CO-5	M	H	H	H	H	-	M	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	M	M	M
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H

(For Candidates admitted from the academic year 2021-22 onwards)

Course Title	**Non Major Elective – 4: FUTURISTIC TECHNOLOGIES IN IT**
Code	**U21CA6NMT04**
Course Type	**Theory**
Semester	**VI**
Hours/Week	**3**
Credits	**3**
Marks	**100**

CONSPECTUS

To enable the students to understand and learn the basic concepts of Futuristic Technologies in IT.

COURSE OBJECTIVE

1. To learn about Edge Computing.
2. To understand the basic concepts of Quantum Computing .
3. To understand the Concepts of Block Chain.
4. To understand and analyze the importance of Cyber Security.
5. To understand the fundamentals of Robotics.

UNIT I **9 Hrs**

EDGE COMPUTING: Computing Paradigms:- Introduction to Computing – Major Impacts of computing- Cloud computing- Edge Computing Essentials: Introduction- Edge computing Architecture – Background Essentials: IoT Devcies-Edge Computing Use Cases-High Potential use cases.

Extra Reading /Keywords: *Mobile Edge Computing.*

UNIT II **9 Hrs**

BIG DATA ANALYTICS: Introduction to Big Data: Characteristics – Evolution – Definition – Challenges with Big Data – other Characteristics of Data – Why Big data- Classification of Digital Data, Structured and unstructured data.

Extra Reading /Keywords: *Importance of Big Data*

UNIT III **9 Hrs**

BLOCK CHAIN: Tracing Block chain's Origin – The shortcomings of current transaction systems – The emergence of bitcoin – The birth of block chain – Exploring a block chain application – Building trust with block chain.

Extra Reading /Keywords: *Tracing a look at howblock chain works*

UNIT IV **9 Hrs**

CYBER SECURITY: Introduction To Cybercrime: Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, Classifications of Cybercrimes Cyber Offenses: Introduction, how criminals Plan the Attacks, Social Engineering Cyber Stalking.

Extra reading /keywords: *Features of Cyber Security.*

UNIT V **9 Hrs**

ROBOTICS: BASIC CONCEPT: Brief history-Types of Robot–Technology-Robot classifications and specifications- Design and control issues- Various manipulators – Sensors - work cell - Programming languages.

Extra Reading /Keywords: *Impact of AI in daily life*

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

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1 – K5)
CO-1	Understand the basic concepts and service providers in cloud computing	K1
CO-2	Understand the characteristics and classification of Big Data	K2
CO-3	Examine the concept cyber security systems and apply some functional examples	K3
CO-4	Analyze the origin and current transaction systems in Block Chain	K4
CO-5	Evaluate the Artificial Intelligence methods and applications	K5

(K1=Remember, K2=Understand, K3=Apply, K4=Analyze, K5=Evaluate)

TEXT BOOKS

1. **Edge Computing Fundamentals**, Advances and Applications, K.Anitha Kumari, D.Sudha Sadhasivam, D.Dharani,M. Niranjanamutrhty, CRS Press,2022. Unit 1: Chapter 1: 1.1,1.2,1.5, Chapter 2:2.1-2.3, chapter 6: 6.1,6.2
2. **Quantum computing in Action**, Johan Vos, 2022, Manning Publications. Unit 2: Chapter 1: 1.1-1.3, 1.4, Chapter 3: 3.1,3.2, Chapter 4: 4.1
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller & Steve Goldfeder, **"Bitcoin and Cryptocurrency Technologies**: **A Comprehensive Introduction, Princeton University Press"**, 2016.
4. Godbole Nina, Belapure Sunit, Cyber **Security Understanding Cyber Crimes**, Computer Forensics and legal perspectives Wiley: April 2011 India.
5. EXT BOOKS: 1. R.K.Mittal and I.J.Nagrath, **Robotics and Control**, Tata McGraw Hill, New Delhi,4th Reprint, 2005.

SUGGESTED READINGS

1. Cloud Computing – CLOUD 2019: 12th International Conference, Held as Part of the Services Conference Federation, SCF 2019, San Diego, CA, USA, June 25–30, 2019, Proceedings. Germany,Springer International Publishing, 2019.
2. S. Kanimozhi Suguna, M. Dhivya, Sara Paiva , **"Artificial Intelligence (AI): Recent TrendsandApplications"**, United States, CRC Press, 2021.
3. Bhushan, Mayank, et al, **"Fundamentals of Cyber Security"**. India, BPB Publications, 2017.
4. Arun K. Somani, Ganesh Ch\ndra **Big Data Analytics: Tools and Technology for Effective Planning**", United States, CRC Press, 2017.
5. Laurence, Tiana. **"Blockchain For Dummies"**, United Kingdom, Wiley, 2019.

WEB REFERENCES

1. https://jump2learn.com/SubjectDetails/202_2
2. https://digitalregulation.org/3004297-2/
3. https://www.ibm.com/topics/blockchain
4. https://www.javatpoint.com/difference-between-artificial-intelligence-and-machine-learning
5. https://www.arcserve.com/blog/7-most-infamous-cloud-security-breaches

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

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO-1	L	L	L	M	L	M	H	H	H
CO-2	M	M	L	M	L	M	H	H	H
CO-3	H	H	M	M	L	H	H	H	H
CO-4	H	H	H	H	M	H	H	H	H
CO-5	H	H	H	M	H	M	M	H	H

PSO – CO MAPPING

CO/PSO	PSO1	PSO2	PSO3
CO-1	L	L	L
CO-2	M	M	M
CO-3	H	H	H
CO-4	H	H	H
CO-5	H	H	H