# SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES

# PG DEPARTMENT OF COMPUTER APPLICATIONS

# BCA
# 2022 - 2025

**(For Candidates admitted from the academic year 2022-23 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)**

## 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.

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**SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES**
**PG DEPARTMENT OF COMPUTER APPLICATIONSCHOICE**
**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 | U22TL1GEN01/ U22HN1HIN01/ U22FR1FRE01 | 3 | 3 | 100 |
| | II | English | English Paper I | U22EL1GEN01 | 3 | 3 | 100 |
| | III | Major Core -1 | Problem Solving using C | U22CA1MCT01 | 5 | 4 | 100 |
| | | Major Core - 2 | Problem Solving using C – Lab | U22CA1MCP02 | 4 | 2 | 100 |
| | | Major Core - 3 | Office Tools and Web Page Designing – Lab | U22CA1MCP03 | 4 | 3 | 100 |
| | | Allied – 1 | Statistical Methods | U22MA1ALT03 | 4 | 2 | 100 |
| | | Allied – 2 | Basics of Accounting | U22CC1ALT02 | 4 | 2 | 100 |
| | IV | Environmental Studies | Environmental Studies | U22ES1EVS01 | 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 | | U22EX1INT01 | - | 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 | U22TL2GEN02/ U22HN2HIN02/ U22FR2FRE02 | 3 | 3 | 100 |
| | II | English | English Paper II | U22EL2GEN02 | 3 | 3 | 100 |
| | III | Major Core – 4 | Data Structures and Algorithms | U22CA2MCT04 | 5 | 4 | 100 |
| | | Major Core – 5 | Data Structures and Algorithms – Lab | U22CA2MCP05 | 4 | 3 | 100 |
| | | Major Core – 6 | Optimization Techniques | U22CA2MCT06 | 5 | 4 | 100 |
| | | Allied – 3 | Numerical Methods | U22MA2ALT12 | 4 | 2 | 100 |
| | IV | Skill Based Course(SBC) – 1 | Soft Skills Development | U22SS2SBC01 | 2 | 1 | 100 |
| | | Skill Based Course(SBC) – 2 | Sustainable Rural Development and Student Social Responsibility | U22RE2SBC02 | 2 | 1 | 100 |
| | | Industrial Relations | Digital Marketing | U22CA2IRT01 | 1 | 1 | 100 |
| | | Value Education | Ethics I / Bible Studies I/ Catechism I | U22VE2LVE01/ U22VE2LVB01/ U22VE2LVC01 | 1 | 1 | 100 |
| | V | Extension Activity | RESCAPES | U22EX2RES01 | - | 1 (EC) | - |
| | VI | Online Course | | U22EX2ONC01 | - | 1 (EC) | 100 |
| | | Service Oriented Course | | - | - | - | |
| | | Internship/ Field Work/ Field Project 30 Hours - Extra Credit | | U22EX2INT02 | | 2 (EC) | 100 |
| | | **TOTAL** | | | **30** | **23+1+1+2** | **1000+ 100+ 100** |

| Semester | Part | Course | Title of the course | Code | Hours/ Week | Credits | Marks |
|---|---|---|---|---|---|---|---|
| III | I | Language | General Tamil - III/ Hindi - III/ French – III | U22TL3GEN03/ U22HN3HIN03/ U22FR3FRE03 | 3 | 3 | 100 |
| | II | English | General English – III | U22EL3GEN03 | 3 | 3 | 100 |
| | III | Major Core - 7 | Database Systems | U22CA3MCT07 | 5 | 4 | 100 |
| | | Major Core - 8 | Database Systems – Lab | U22CA3MCP08 | 5 | 4 | 100 |
| | | Allied – 4 | Discrete Mathematics | U22MA3ALT16 | 4 | 2 | 100 |
| | | Major Elective -1 | Major Elective -1 | - | 4 | 3 | 100 |
| | IV | Major Skill Based Elective–1 | Web Designing Using PHP –Lab | U22CA3SBP01 | 2 | 1 | 100 |
| | | Non Major Elective-1 | Non Major Elective-1 | - | 2 | 2 | 100 |
| | | Gender Studies | Gender Studies | U22WS3GST01 | 1 | 1 | 100 |
| | | Value Education | Ethics II / Bible Studies II/ Catechism II | - | 1 | - | - |
| | VI | Online Course | | U22EX3ONC02 | - | 1 (EC) | 100 |
| | | Service Oriented Course | | - | - | - | |
| | | Internship / Field Work / Field Project 30 Hours - Extra Credit | | U22EX3INT03 | - | 2 (EC) | 100 |
| | | **TOTAL** | | | **30** | **23+1+2** | **900+ 100+ 100** |

| Semester | Part | Course | Title of the course | Code | Hours / Week | Credits | Marks |
|---|---|---|---|---|---|---|---|
| IV | I | Language | Tamil Paper IV/<br>Hindi Paper IV/<br>French Paper IV | U22TL4GEN04/<br>U22HN4HIN04/<br>U22FR4FRE04/ | 3 | 3 | 100 |
| | II | English | English Paper IV | U22EL4GEN04 | 3 | 3 | 100 |
| | III | Major Core – 9 | Java Programming | U22CA4MCT09 | 5 | 4 | 100 |
| | | Major Core – 10 | Java Programming – Lab | U22CA4MCP10 | 4 | 4 | 100 |
| | | Major Elective –2 | Major Elective –2 | - | 4 | 3 | 100 |
| | | Allied – 5 | Cost and Management Accounting | U22CC4ALT03 | 4 | 2 | 100 |
| | | Allied – 6 | Accounting Software –Tally | U22CC4ALP04 | 4 | 2 | 100 |
| | IV | Non MajorElective – 2 | Non Major Elective – 2 | - | 2 | 2 | 100 |
| | | Value Education | Ethics II /<br>Bible Studies II/<br>Catechism II | U22VE4LVE02/<br>U22VE4LVB02/<br>U22VE4LVC02/ | 1 | 1 | 100 |
| | V | Extension Activity | RESCAPES | U22EX4RES02 | - | 1 (EC) | - |
| | VI | Service Oriented Course | | U22EX4SOC01 | - | 2 (EC) | 100 |
| | | Internship / Field Work / Field Project 30 Hours - Extra Credit | | U22EX4INT04 | - | 2 (EC) | 100 |
| | | **TOTAL** | | | **30** | **24+2+2+1** | **900+ 100+ 100** |

| Semester | Part | Course | Title of the course | Code | Hours/ Week | Credits | Marks |
|---|---|---|---|---|---|---|---|
| V | III | Major Core –11 | Software Engineering Concepts | U22CA5MCT11 | 4 | 4 | 100 |
| | | Major Core –12 | Cloud Computing | U22CA5MCT12 | 4 | 4 | 100 |
| | | Major Core –13 | Computer Networks | U22CA5MCT13 | 4 | 4 | 100 |
| | | Major Core –14 | Object-Oriented Programming Using C# and .Net | U22CA5MCT14 | 5 | 5 | 100 |
| | | Major Core–15 | Object-Oriented Programming Using C# and .Net – Lab | U22CA5MCP15 | 4 | 3 | 100 |
| | | Major Elective–3 | Fundamentals of Data Science/ Digital Marketing | U22CA5MET05/ U22CA5MET06 | 4 | 3 | 100 |
| | IV | Non Major Elective - 3 | Non Major Elective – 3 | - | 2 | 2 | 100 |
| | | Major Skill Based Elective – 2 | Multimedia – Lab | U22CA5SBP02 | 2 | 1 | 100 |
| | | Value Education | Ethics III / Bible Studies III/ Catechism III | - | 1 | - | - |
| | VI | Online Course | | U22EX5ONC03 | - | 1 (EC) | 100 |
| | | Internship / Field Work/ Field Project 30 Hours - Extra Credit | | U22EX5INT05 | | 2 (EC) | 100 |
| | | TOTAL | | | **30** | **26+1+2** | **800+ 100+ 100** |

| Semester | Part | Course | Title of the course | Code | Hours/ Week | Credits | Marks |
|---|---|---|---|---|---|---|---|
| VI | III | Major Core–16 | Operating Systems | U22CA6MCT16 | 5 | 4 | 100 |
| | | Major Core–17 | Computer Graphics | U22CA6MCT17 | 4 | 4 | 100 |
| | | Major Core–18 | Internet of Things | U22CA6MCT18 | 4 | 3 | 100 |
| | | Major Core–19 | Big Data Analytics | U22CA6MCT19 | 4 | 3 | 100 |
| | | Major Core–20 | Information and Cyber Security | U22CA6MCT20 | 4 | 4 | 100 |
| | | Major Elective – 4 | Data Analytics Tools - Lab/ Software Testing – Lab | U22CA6MEP07/ U22CA6MEP08 | 4 | 3 | 100 |
| | IV | Non Major Elective–4 | Non Major Elective – 4 | - | 2 | 2 | 100 |
| | | Skill Based Course (SBC) – 3 | Research Methodology | U22DS6SBC03 | 2 | 1 | 100 |
| | | Value Education | Ethics III / Bible Studies III/ Catechism III | U22VE6LVE03/ U22VE6LVB03/ U22VE6LVC03 | 1 | -- | 100 |
| | V | Extension Activity | RESCAPES- Impact study of Project | U22EX6RES03 | - | 1 (EC) | 100 |
| | VI | Internship / Field Work / Field Project30 Hours–Extra Credit | | U22EX6INT06 | - | 2 (EC) | 100 |
| | | **TOTAL** | | | **30** | **24+2+1** | **900+ 100+ 100** |
| | | **GRAND TOTAL** | | | **180** | **140+8+ 12 = 160** | **5200+ 300+ 600** |
| VI | | ED: Extra credit (Mini Project) | | U22CA6ECP01 | - | 2**(EC)** | 100 |

**LISTOF ALLIED PAPERS OFFERED BY THE DEPARTMENT TO OTHER DEPARTMENTS**

| Semester | Part | Course and Department | Title of the Course | Code | Hours/ Week | Credits | Marks |
|---|---|---|---|---|---|---|---|
| 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 | U22CA2ALT01 | 4 | 2 | 100 |
| III | III | B.Com (CA) | **Allied – 4** R Programming – Lab | U22CA3ALP04 | 4 | 2 | 100 |
| III | III | B.Sc. Physics | **Allied – 4** Database Management Systems | U22CA3ALT05 | 4 | 2 | 100 |
| IV | III | B.Com (CA) | **Allied – 6** Relational Database Management System | U22CA4ALT06 | 4 | 2 | 100 |
| IV | III | B.Sc. Physics | **Allied – 5** Programming in C | U22CA4ALT07 | 4 | 2 | 100 |
| IV | III | B.Sc. Physics | **Allied – 6** Programming in C - Lab | U22CA4ALP08 | 4 | 2 | 100 |
| IV | III | Biotechnology | **Allied – 5** Programming Concepts for Biotechnology | U22CA4ALT09 | 4 | 2 | 100 |
| IV | III | Biotechnology | **Allied – 6** Programming Concepts for Biotechnology - Lab | U22CA4ALP10 | 4 | 2 | 100 |

**Major Elective Courses offered by the department:**

| Semester | Part | Course | Title of the Course | Code | Hrs/ Wk | Credits | Marks |
|---|---|---|---|---|---|---|---|
| III | III | Major Elective-1 | Modern Technologies in IT (II B.Com CA) / Human Computer Interaction (II B.Sc CS, II B.Sc Maths 'A' & 'B') | U22CA3MET01/ U22CA3MET02 | 4 | 3 | 100 |
| IV | III | Major Elective–2 | Ethical Hacking (Maths, CS, Physics, B.Com CA ) | U22CA4MET03 | 4 | 3 | 100 |
| IV | III | Major Elective–2 | Web Technology (B.Com CA) | U22CA4MET04 | 4 | 3 | 100 |
| V | III | Major Elective–3 | Introduction to Python Programming | U22CA5MEP04 | 4 | 3 | 100 |
| VI | IV | Major Elective-4 | Relational Database Management Systems-Lab (III B.Com CA) | U22CA5MEP09 | 4 | 3 | 100 |

**Non Major Elective Courses offered by the department:**

| Semester | Part | Course | Title of the Course | Code | Hrs / Wk | Credits | Marks |
|---|---|---|---|---|---|---|---|
| III | IV | Non Major Elective-1 | Introduction to IT Hardware and Software | U22CA3NMT01 | 2 | 2 | 100 |
| IV | IV | Non Major Elective – 2 | Basic Drawing and Editing-Lab | U22CA4NMP02 | 2 | 2 | 100 |
| V | IV | Non Major Elective– 3 | Internet of Things & its Applications | U22CA5NMT03 | 2 | 2 | 100 |
| VI | IV | Non Major Elective-4 | Futuristic Trends in IT | U22CA6NMT04 | 2 | 2 | 100 |

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**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** | **U22CA1MCT01** |
| **Course type** | **Theory** |
| **Semester** | **I** |
| **Hours/Week** | **5** |
| **Credits** | **4** |
| **Marks** | **100** |

**CONSPECTUS**

To understand the concept of problem solving approaches and to develop programming skills 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 /Key words***: 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***

**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 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)**

**CO - Course Outcomes**

**PRESCRIBED TEXT BOOKS**


1. M. T. Somashekara, "Problem Solving with C", PHI Learning Private Limited, Second Edition 2018.
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, 2019.
2. Paul Deitel and Harvey Deitel, **"**C How to Program with an introduction to C++**"**, Eighth Edition, Pearson Education Pvt. Ltd.,2016.
3. Yashavant Kanetkar, **"**Let us C**"**, Fifteenth Edition, Pearson Education Pvt.Ltd., New Delhi, 2017.
4. Ashok. N. Kamthane, Amit A. Kamthane., **"**Programming in ANSI C**"**, Pearson Education Pvt. Ltd.,New Delhi, 2015.
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.***

**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 |

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**LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)**
**BCA - First Year - Semester – I**

| | |
|---|---|
| **Course Title** | **Major Core 2: Problem Solving using C - Lab** |
| **Code** | **U22CA1MCP02** |
| **Course type** | **Practical** |
| **Semester** | **I** |
| **Hours/Week** | **4** |
| **Credits** | **2** |
| **Marks** | **100** |

## CONSPECTUS

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

## COURSE OBJECTIVES

1. To recall the syntax ofcontrol 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**

**The Learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level (K1-K6) |
|---|---|---|
| CO 1 | Recognize the basics of CProgramming | 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 realtime problems. | K4 |

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

**CO - Course Outcomes**

**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 |

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**BCA - First Year - Semester – I**

| | |
|---|---|
| **Course Title** | **Major Core: 3 - Office Tools and Web Page Designing - Lab** |
| **Code** | **U22CA1MCP03** |
| **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 concepts of creating a document, formatting the text, spell check andprinting the document and html and styles sheets.
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 and to create a website

## LIST OF PRACTICAL EXERCISES

**MS-WORD:**

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

**3. Spell check the document using:**

a. Finding and Replacing of text
b. Bookmarks and Searching for a Bookmarks
c. Checking Spelling and Grammar automatically
d. Checking Spelling and Grammar using Dictionary

**4. Print the document using:**

e. Print Preview
f. Print Dialog box

**5. Mail Merge in MS-WORD**

g. Create main document and data file for mail 15merging
h. Merging the files
i. From letters using mail merging
j. Mailing labels using mail merging

**6. Table creation in MS-WORD**

k. Create a table in the document
l. Add row, column to a table
m. Changing column width and row height.
n. Merge, split cells of table.
o. Use formulae in tables.
p. sorting data in a table.
q. 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 Emp.no, 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
    - layout of opening screen in Power Point
    - the toolbars in MS Power Point
    - Choose Auto Layout for a new slide.
    - Insert text and pictures into a blank slide.
    - Insert new slides into the presentation.
    - Apply slide transition effects.
    - Slide show.
    - Set animation to text and pictures in a slide
    - Set the sounds, order and timing for animation

**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

**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, HTML5 & CSS. | K1 |
| CO 2 | Discuss the concepts of creating documents, data analysis, graphical representations, preparing presentations and creating web pages. | K2 |
| CO 3 | Solve real time applications using appropriate formulae, use correct formatting to organize the data and creating website. | K3 |
| CO 4 | Examine the data visually through graphical Representations, Create professional presentations and Websites. | K4 |

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

**CO - Course Outcomes**

**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 from the academic year 2022-23 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. - First Year - Semester – II**

| **Course Title** | **Major Core : 4 - Data Structures and Algorithms** |
|---|---|
| **Code** | **U22CA2MCT04** |
| **Course type** | **Theory** |
| **Semester** | **II** |
| **Hours/Week** | **5** |
| **Credits** | **4** |
| **Marks** | **100** |

**CONSPECTUS**

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** **15Hrs**

**INTRODUCTION TO DATA STRUCTURE:** Definitions – Overview of Data Structures - Implementation of Data Structures. **ARRAYS:** Definition – Terminology – One-dimensional Array: Operations on Arrays. **STACK:** Definition and Example – 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** **15Hrs**

**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** **15Hrs**

**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** **15Hrs**

**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** **15Hrs**

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

**COURSE OUTCOMES**
**The Learner will be able to:**

| 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)**

**CO – Course Outcomes**

**PRESCRIBED 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, Sartaj Sahni 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.***

**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 from the academic year 2022-23 onwards)**
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**PG DEPARTMENT OF COMPUTER APPLICATIONS**
**CHOICE BASED CREDIT SYSTEM**
**LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)**
**B.C.A. - First Year - Semester – II**

| | |
|---|---|
| **Course Title** | **Major Core : 5 - Data Structures and Algorithms - Lab** |
| **Code** | **U22CA2MCP05** |
| **Course type** | **Practical** |
| **Semester** | **II** |
| **Hours/Week** | **4** |
| **Credits** | **3** |
| **Marks** | **100** |

**GENERAL OBJECTIVE:**

Student learns to develop C program for implementing different kind of Data Structures.

**COURSE OBJECTIVES:**

1. To remember stack concepts and develop programs using C.
2. To understand the concepts of Queue and develop programs using C.
3. To insert and delete nodes into and from a linked list using C.
4. To develop C programs for implementing different sorting techniques.
5. To Develop C programs for searching an element in an array.
6. To find the shortest path in a graph using C

**EXERCISES**

1. Operations on Stack and Conversion of expressions.

2. Operations on Queue.

3. Operations on Linked List.

4. Operations on Binary tree and Traversals.

5. SORTING:

a. Bubble Sort.

b. Insertion Sort.

c. Selection Sort.

d. Heap Sort.

e. Quick Sort.

6. SEARCHING:

a. Linear Search.

b. Binary Search.

7. Dijkstra's Algorithm to find the Shortest Path.

**COURSE OUTCOMES**
**The Learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level |
|---|---|---|
| **CO-1** | Recognize the different sorting and searching algorithms | K1 |
| **CO-2** | Identify the various operation in stack, queue and their applications | K2 |
| **CO-3** | Apply various types of Linked List and their Applications | K3 |
| **CO-4** | Performs the operations on finding the shortest path | K4 |

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

**CO – Course Outcomes**

**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 from the academic year 2022-23 onwards)**
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**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**<br>**COMPUTER APPLICATIONS IN BUSINESS** |
| **Code** | **U22CA2ALT01** |
| **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**

To enable the learners:

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 hardware, software, components of control panel, functions of operating system, types and functions of mobile operating system, explore various features and operations of Word processor.
3. To explain the features of Excel environment and create worksheets with manipulating statistical commands.
4. To develop power point presentation with multimedia effects; build a database with related Tables and apply different methods to perform database query with generate reports.
5. To understand ecommerce framework with real-time applications.

**UNIT I** **12 Hrs**

**INFORMATION TECHNOLOGY: *Introductio*n:** 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, Block chain, Internet of Things (IoT), 5G, Cyber Security.

**Extra Reading/ Keywords:** *Cyber Law Security and Practices*

**UNIT II** **12 Hrs**

**INTRODUCTION TO COMPUTERS: *Hardware and Software:* C**oncept of Hardware and Software. ***Windows Basics***: Working with Files & Folders- Control Panel Components in Windows. ***Operating System***: Meaning, Definition and Functions of OS.

***Mobile Operating System***: Functions – Types – Features of Mobile OS. ***Word Processing***:

Basic parts of Word - 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 - Templates.
**Extra Reading/ Keywords***: An overview of various Computer & Mobile OS*

**UNIT III** **12 Hrs**

**SPREAD SHEET**: 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 – Using Date and Addressing Modes. ***Formulas and Functions***: Functions and Formulas - Using Auto Sum, Auto Fill and Command, and Using Statistical Math and Financial Functions. ***Data Analysis***: Pivot Tables – What-If Analysis – Conditional Formatting - Sorting Data, Filtering Data – Multiple worksheets. Macros. ***Charts***: Creating and Inserting a Chart and Transporting to Word and PowerPoint Documents.
**Extra Reading/ Keywords:** *Import Excel to analysis tools*

**UNIT IV** **12 Hrs**

**POWER POINT:** 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. **ACCESS:** Introduction to Access - Creating a New Database, Creating Tables, Working with Forms, Creating queries, Creating Reports, Types of Reports. Entering and Editing Data - Finding, Sorting and Displaying Data. Finding Information in Databases, Printing & Print Preview.
**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.
**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.**

**COURSE OUTCOMES**
**The Learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level (K1-K6) |
|---|---|---|
| **CO-1** | Remember the basic concepts of Information Technology and explore emerging IT trends in different fields. | **K1** |
| **CO-2** | Recall the basic terminologies of Hardware and Software; understands the functions of Operating System, features of Word Processing. | **K2** |
| **CO-3** | Understands the features of Excel Environment and build spreadsheets to perform calculations, to analyze and visualize data in real time. | **K3** |
| **CO-4** | Identify the functions of the PowerPoint interface and prepare the presentations. Understands the elements of database design and construct databases to store, extract, and analyze the real time data. | **K4** |

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

**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. Dorothy House, **"Microsoft Word, Excel, and PowerPoint**: **Just for Beginners"** Paperback Import.

**WEB REFERENCES**

1. https://www.tutorialspoint.com/computer_concepts
2. https://connect.comptia.org/blog/emerging-trends-in-information-technology
3. https://www.tutorialspoint.com/ word /excel/powerpoint/ms_access
4. https://www.javatpoint.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** | 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 2022-23 )**

**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** | **U22CA3MCT07** |
| **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 enable the students to learn the basic concepts of data base systems, file systems and evolution of data models.
2. To recognize the foundation on the relational model of data and process of drawing the ER-Diagrams.
3. To organize, maintain and retrieve - efficiently and effectively - information from a DBMS using SQL Queries and joining database tables.
4. To analyze the concepts of Normalization in Database Tables.
5. To learn and understand to write queries using Advanced SQL, Sub Queries and Correlated Queries.

**UNIT- I:** **15 Hrs**

Database Concepts: Database Systems - Data vs Information - Introducing the database -File system -Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction.

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

**UNIT II:** **15 Hrs**

Design Concepts: Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog – relationships within the data redundancy revisited -indexes - codd's rules. Entity relationship model: Developing an ER diagram.

**Extra reading/Key words :** *PostgreSQL, Embedded SQL*

**UNIT- III** **15 Hrs**

Introduction to SQL: Data Definition Commands – Data Manipulation Commands – SELECT Queries –Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.

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

**UNIT IV:** **15 Hrs**

**Normalization of Database Tables**: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form.

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

**UNIT V:** **15 Hrs**

**Advanced SQL**: Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join. **Sub Queries and Correlated Queries**: WHERE – IN – HAVING – ANY and ALL – FROM. **SQL Functions**: Date and Time Function – Numeric Function – String Function – Conversion Function. **Procedural SQL:** Triggers - Stored Procedures - PL/SQL Processing with Cursors - PL/SQL Stored Functions.

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

***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 various basic concepts of Data Base System. Difference between file system and DBMS. | K1 |
| **CO-2** | Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model and compare various data models. | K2 |
| **CO-3** | Classify the different SQL functions and various join operations and enhance the knowledge of handling multiple tables. | K3 |
| **CO-4** | Construct different databases by applying normalization techniques to solve the realworld problems. | K4 |
| **CO-5** | Learn basics of PL/SQL and develop programs using Cursors, Exceptions. | K5 |

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

**CO – Course Outcomes**

**TEXT BOOK**

Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", 12th Edition, 2017

Unit I : Chapter 1(1.1 -1.3, 1.6, 1.7) , Chapter 2(2.1-2.6)
Unit II: Chapter 3(3.1-3.9), Chapter 4(4.2)
Unit III: Chapter 7(7.1 – 7.7)
Unit IV: Chapter 6(6.1-6.3, 6.6)
Unit V: Chapter 8(8.1-8.4, 8.7)

**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. Abraham Silberschatz, Henry F.Korth and S.Sudarshan**,"Database System Concepts**", McGraw Hill International Publication ,VI Edition.
5. Shio Kumar Singh , "**Database Systems ",**Pearson publications ,II Edition

**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 2022-23 )**

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**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 Systems–Lab** |
| **Code** | **U22CA3MCP08** |
| **Course type** | **Practical** |
| **Semester** | **III** |
| **Hours/Week** | **5** |
| **Credits** | **4** |
| **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 program to prepare mark sheet.
9. PL/SQL program to prepare a pay slip.
10. PL/SQL program to prepare the electricity Bill.
11. PL/SQL program to prepare the multiplication table for a given number.
12. PL/SQL program to count the number of characters and digits in a string.

**COURSE OUTCOMES**

**The Learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level (K1-K5) |
|---|---|---|
| **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 2022- 23)**
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**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 Technologies in IT (COMMERCE)** |
| **Code** | **U22CA3MET01** |
| **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. To understand the concepts of Cloud Computing Services, Layers and Models;
2. To apply the concepts of Wireless sensor network;
3. To analyze the different Stack layers of big data;
4. To understand the Mobile security;
5. To 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- Seven Step Model of Migration into a Cloud- Data security in the Cloud.
**Extra Reading/Keywords:** *Services on Cloud, characteristics and different kinds of Cloud.*

**UNIT II** **12 Hrs**

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

**UNIT III** **12 Hrs**

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

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

**UNIT IV** **12 Hrs**

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

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

**UNIT V** **12 Hrs**

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

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

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

**COURSE OUTCOMES**

**The Learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level (K1-K5) |
|---|---|---|
| **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**

**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 READINGS**

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), Jonesand 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 |

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**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 : Human Computer Interaction** **(COMPUTER SCIENCE & MATHEMATICS )** |
| **Code** | **U22CA3MET02** |
| **Course type** | **Theory** |
| **Semester** | **III** |
| **Hours/Week** | **4** |
| **Credits** | **3** |
| **Marks** | **100** |

**CONSPECTUS**

To understand the basic concepts of Human Computer Interaction Models and factors that determine how people use technology.

**COURSE OBJECTIVES**

1. To learn about the foundations of Human Computer Interaction.
2. To learn the design and software process technologies.
3. To learn HCI models and theories.
4. To learn Mobile Ecosystem.
5. To learn the various types of Web Interface Design.

**UNIT I** **12 Hrs**

FOUNDATIONS OF HCI : · The Human: I/O channels –Reasoning and problem solving;
The Computer: Devices – Memory; Interaction: Models – frameworks - elements – interactivity.
**Extra Reading /Keywords:** *I/O Channels , Memory*

**UNIT II** **12 Hrs**

DESIGN & SOFTWARE PROCESS: · Interactive Design: · Basics – process – scenarios. HCI in software process: Software life cycle. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.
**Extra Reading /Keywords:** *Navigation Design*

**UNIT III** **12 Hrs**

MODELS AND THEORIES: · HCI Models : Cognitive models: Communication and collaboration models-Hypertext, Multimedia and WWW.
**Extra Reading /Keywords:** *Stakeholder Requirements*

**UNIT IV** **12 Hrs**

Mobile HCI: · Mobile Ecosystem: Platforms. Types of Mobile Applications: Widgets, Applications, Games. Mobile Information Architecture. Case Studies.

**Extra Reading /Keywords:** *Mobile Design Elements*

**UNIT V** **12 Hrs**

WEB INTERFACE DESIGN: Designing Web Interfaces –Direct Selection, Contextual Tools - Case Studies.

**Extra Reading /Keywords:** *Virtual Pages*

***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-K5) |
|---|---|---|
| **CO-1** | Understand the fundamentals of HCI. | K1 |
| **CO-2** | Understand the design and software process technologies. | K2 |
| **CO-3** | Understand HCI models and theories. | K3 |
| **CO-4** | Understand Mobile Ecosystem, types of Mobile Applications, mobile Architecture and design. | K4 |
| **CO-5** | Understand the various types of Web Interface Design. | K5 |

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

**CO – Course Outcomes**

**TEXT BOOKS**


1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ”Human -Computer Interaction‖”, III Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, —”Mobile Design and Development”, I Edition, O‘Reilly Media Inc., 2009(UNIT–IV)
3. Bill Scott and Theresa Neil, —Designing Web Interfaces‖, First Edition, O‘Reilly, 2009. (UNIT-V)

**SUGGESTED READINGS**


1. Shneiderman, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", V Edition, Pearson Education.
2. J Preece , H Sharp, Y Rogers " Interaction design: beyond human- computer interaction", IV Edition,Wiley. 2015
3. Inaki Maurtua, "Human – Computer Interaction", IntechOpen , 2014
4. Nirmalya Thakur , Parameshachari B.D. "Human – Computer Interaction and Beyond : Advances Towards Smart and Interconnected Environments, Bentham,2021.
5. K.Meena , R.Siva Kumar , " Human Computer Interaction" , PHI Learning Private Limited, 2015.


**WEB REFERENCES**

1. https://www.interaction-design.org/literature/topics/human-computer-interaction
2. https://link.springer.com/10.1007/978-0-387-39940-9_192
3. https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction

***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 | M | M | M | M | L | H | H | M |
| **CO-2** | M | M | M | M | M | L | H | H | H |
| **CO-3** | H | H | H | M | M | L | H | H | H |
| **CO-4** | H | H | H | H | H | L | H | H | H |
| **CO-5** | M | M | M | L | M | M | M | 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 |


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

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**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**<br>**Web Designing Using PHP–LAB** |
| **Code** | **U22CA3SBP01** |
| **Course type** | **Practical** |
| **Semester** | **III** |
| **Hours/Week** | **2** |
| **Credits** | **1** |
| **Marks** | **100** |

**CONSPECTUS**

To develop websites by using Script type HTML, CSS, JavaScript, jQuery, and PHP scripting languages.

**COURSE OBJECTIVES**

1. To imply the concepts of HTML and Cascading Style Sheets.
2. To learn and apply the JavaScript object methods and events
3. To learn how to use jQuery for effective website creation
4. To learn various functions of PHP and MySQL
5. To understand and develop the dynamic website using Scripting languages with database connection

**EXERCISES**

**JavaScript**

1. Simple Programs: Creation and declaration of Variables, Datatype and type of operator
2. Evaluating Arithmetic Expression
3. Design a Web Form using Form Elements and Count the Number of Elements in a Form
4. Design a Web Form with validating user inputs
5. Design a Web page with dynamic effects - to include layers and basic animation.
6. Design a Web page for Students Mark Report
7. Design a Web page for Pay Roll Management

**jQuery**

8. Design a Website with the animation effects using HTML, CSS, JavaScript and jQuery

**PHP & MySQL**

9. Creating a simple PHP program using the concepts: Flow Control, Strings and Arrays, creatingFunctions.
10. Design a form and insert data into database. Perform the following operations: Add Record, delete and edit, Search Record using HTML, CSS, JavaScript and PHP

**COURSE OUTCOMES**
**The Learner will be able to**

| CO No. | Course Outcomes | Cognitive Level (K1-K5) |
|---|---|---|
| **CO-1** | Recall the basic concepts of HTML5, CSS | K1 |
| **CO-2** | Interpret an apply web page styles and handling web page events using JavaScript and CSS. | K2 |
| **CO-3** | Apply the JavaScript functions for data validation in webpage creation | K3 |
| **CO-4** | Analyze the animation effects on a web page using jQuery | K4 |
| **CO-5** | Evaluate the dynamic website with MySQL and PHP for real time applications | 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** | H | M | M | M | M | L | H | H | M |
| **CO-3** | H | M | M | M | M | L | H | H | M |
| **CO-4** | H | H | M | M | M | L | H | H | M |
| **CO-5** | H | H | M | M | M | L | H | H | M |

**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 |

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**CHOICE BASED CREDIT SYSTEM**
**LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)**
**BCA – Second Year - Semester – III**

| | |
|---|---|
| **Course Title** | **Non Major Elective -1- Introduction to IT Hardware and Software** |
| **Code** | **U22CA3NMT01** |
| **Course type** | **Theory** |
| **Semester** | **III** |
| **Hours/Week** | **2** |
| **Credits** | **2** |
| **Marks** | **100** |

**CONSPECTUS**

To give Basic Knowledge on the fundamentals of computer hardware components, mobile devices, system design and operating systems set up procedures.

**COURSE OBJECTIVES**

1. To Learn the fundamentals of computers hardware components
2. To understand the mobile device types and its applications
3. To understand computer system design and the boot process
4. To differentiate the different operating systems
5. To learn the use of windows desktop components

**UNIT I** **6 Hrs**

**Basic Skills:** Searching for Information on the Internet-Screen Capturing-Creating a Text File-Types of Computers-Basic Computer Hardware-Mice and Keyboards-1s and 0s-Safety Notes

**Extra Reading /Key words:** *RAM,ROM*

**UNIT II** **6 Hrs**

Mobile Devices: Mobile Device Overview-Using Mobile Devices-Cell Phones-Mobile Apps - Mobile Device Wired Connectivity- Mobile Device Wireless Connectivity.

**Extra Reading /Key words:** *5G,6G*

**UNIT III** **6 Hrs**

Computer System Design-Motherboard and Associated Component Design-Troubleshooting Overview: The boot process-POST Codes and Error Messages-Other Diagnostics-Hardware Errors-Software Errors

**Extra Reading /Key words:** *Error codes, Boot process failures*

**UNIT IV** **6 Hrs**

Introduction to Operating Systems: User Interaction with Operating Systems- 32-Bit vs. 64-Bit Operating Systems-Windows 10 and Windows 11 Versions-Operating Systems for Mobile Devices- End-of-Life (EOL) Concerns-Update Limitations-Compatibility Concerns.

**Extra Reading /Key words:** *Android, iOS*

**UNIT V** **6 Hrs**

Windows 10 and Windows 11 Desktop Component Shortcuts and Tiles- Recycle Bin-Interactions Within a Window-Managing Windows Files and Folders-Searches and Indexing-Attributes, Compression, and Encryption-Introduction to Windows Control Panel Utilities-Determining the Windows Version-Backing Up Data-WinRE-Recovering the Windows OS

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

**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-K5) |
|---|---|---|
| **CO-1** | Understand fundamentals of PC technology and memory types. | K1 |
| **CO-2** | Recognize and distinguish mobile devices and operating systems. | K2 |
| **CO-3** | Apply the procedure to identify the errors in the boot process. | K3 |
| **CO-4** | Demonstrate the troubleshooting procedure for both hardware and software issues. | K4 |
| **CO-5** | Evaluate the features of various versions of operating systems. | K5 |

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

**CO – Course Outcomes**

**TEXT BOOK**

1. Cheryl A. Schmidt, Christopher A. Lee, **"Complete A+ Guide to IT Hardware and Software: CompTIA A+ Exams 220-1101 & 220-1102"**, 2023, Pearson Education Pvt. Ltd., New Delhi Unit 1: Chapter 1
Unit 2: Chapter 10
Unit 3:Chapter 10
Unit 4: Chapter 11
Unit 5: Chapter 14

**SUGGESTED READINGS**


1. Joel Rosenthal, Rev. Msgr. Kevin W. Irwin, **"PC Repair and Maintenance: A PracticalGuide"**, 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 CompanionGuide"**, 2008, Cisco Press, Pearson India.
5. Ron Gilster, **"PC Hardware: A Beginner's Guide"**, 2001, Tata McGraw – Hill PublishingCompany, 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

**PO – CO MAPPING**

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

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

**(For Candidates admitted in the academic year 2022-2023)**
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**PG DEPARTMENT OF COMPUTER APPLICATIONS**
**CHOICE BASED CREDIT SYSTEM**
**LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)**
**Allied - Second Year - Semester – III**

| | |
|---|---|
| **Course Title** | **Allied-4 - R Programming- Lab (COMMERCE)** |
| **Code** | **U22CA3ALP04** |
| **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 program to get the first 10 Fibonacci numbers.
2. Write a R program to get all prime numbers up to a given number.
3. Write a R program to find the factors of a given number.
4. Write a R program to find the maximum and the minimum value of a given vector.
5. Write a R program to get the unique elements of a given string and unique numbers of vector.
6. 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.
7. Write a R program to create a list of random numbers in normal distribution and count occurrences of each value.
8. Write a R program to create a simple bar plot of five subjects marks.
9. Write a R program to create a Data frames which contain details of 5 employees and display the details.

**COURSE OUTCOMES**

**The Learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level (K1-K5) |
|---|---|---|
| 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 | L | H | H | H |
| **CO-2** | M | M | L | M | L | L | H | H | H |
| **CO-3** | H | H | M | M | L | L | H | H | H |
| **CO-4** | H | H | H | H | M | 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** | 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 2022-2023)**

**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI- 620002**

**SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES**

**PG DEPARTMENT OF COMPUTER APPLICATIONS**

**CHOICE BASED CREDIT SYSTEM**

**B.Sc. Physics - Second Year - Semester – III**

| | |
|---|---|
| **Course Title** | **Allied-4 - Database Management Systems (PHYSICS)** |
| **Code** | **U22CA3ALT05** |
| **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 enable the students to learn the basic concepts of data base systems, file systems and the introduction of data models.
2. To understand the different data models and its applications
3. To analyze the relational and entity-relational data model with their basic components, operators and data dictionary. Design the relationships using tables and ER diagrams
4. To understand basic concepts of Normalization in Database Tables and apply them in designing the databases.
5. To understand the basic SQL and data manipulation commands to apply to create the databases.

**UNIT I : Database Concepts: 12 Hrs**

Database Systems - Data vs Information - Introducing the database: Role and Advantages of the DBMS, Types of Databases-File system - Evolution of File System-- Problems with filesystem Data Processing – Database systems. Data models: - Importance - Basic Building Blocks - Business rules.

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

**UNIT II : Evolution of Data models: 12 Hrs**

Hierarchical and Network Models - The Relational Model,- Entity Relationship Model- The Object-Oriented (OO) Model- Object/Relational and XML, Emerging Data Models - Degrees of Data Abstraction**:** The External Model- The Conceptual Model, The Internal Model, The Physical Model.

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

**UNIT III : Relational database model: 12 Hrs**

Introduction to SQL- logical view of data-keys -Integrity rules - relational set operators **D**ata dictionary and the system catalog – relationships within the relational databases.

**Entity relationship model:** The Entity Relationship Model (ERM)-Developing an ER diagram.

**Extra reading/Key words : *PostgreSQL, Embedded SQL.***

**UNIT- IV Normalization of Database Tables**: **12 Hrs**

Database tables and Normalization – The Need for Normalization – The Normalization Process – Higher level Normal Form.

**Extra reading/Key words*: 6NF***

**UNIT – V: Introduction to SQL:** **12 Hrs**

**Data Definition Commands** :The Database Model - Creating The Database - The Database Schema - Data Types-Creating Table Structures - **Data Manipulation Commands**: Adding, saving, Listing, Updating, Restoring, Deleting, Inserting Table Rows with a Select Sub query - SELECT Queries – Additional Data Definition Commands

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

**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-K5) |
|---|---|---|
| **CO-1** | Remember the various basic concepts of Data Base System. Difference between file system and DBMS, Define the integrity constraints | K1 |
| **CO-2** | Understand the basic concepts of different types of data models. | K2 |
| **CO-3** | Apply the concepts of Relational Data Model and Entity-Relationship Model to develop the database. | K3 |
| **CO-4** | Explain the database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. | K4 |
| **CO-5** | Evaluate the basics of SQL to develop database tables and to attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML). | K5 |

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

**CO – Course Outcomes**

**TEXT BOOKS**

1. Coronel, Morris, "Database Systems, Design, Implementation and Management", 12th Edition, 2017

Unit I : Chapter 1(1.1 -1.3, 1.5- 1.7) , Chapter 2(2-1,2.4)
Unit II: Chapter 2(2.5-2.6),
Unit III: Chapter 3(3.1-3.6), Chapter 4(4.1-4.2)
Unit IV: Chapter 6(6.1-6.3, 6.6)
Unit V: Chapter 7(7.1,7.2 a-7.2 e, 7.3, – 7.5)

**SUGGESTED READINGS**

1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition.
2. Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition
3. Albert Lulushi, "Developing ORACLE FORMS Applications", Prentice Hall ,1997.

**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 | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 |
|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | H | H | M | M | M | L | H | H | H |
| **CO 2** | H | H | M | M | M | L | H | H | H |
| **CO 3** | H | H | M | M | M | L | H | H | H |
| **CO 4** | H | H | M | M | M | L | H | H | H |
| **CO 5** | H | H | M | M | M | 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 from the academic year 2022-23 onwards)**

| | |
|---|---|
| **Course Title** | **Major Core - 9 - JAVA PROGRAMMING** |
| **Code** | **U22CA4MCT09** |
| **Course Type** | **Theory** |
| **Semester** | **IV** |
| **Hours/week** | **5** |
| **Credits** | **4** |
| **Marks** | **100** |

**CONCEPTUS**

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

**COURSE OBJECTIVES**

1. To understand & Analyze the Java features and Program Structure;
2. To apply the concepts of encapsulation in terms of classes and objects;
3. To understand and implement the types of Inheritance & Package;
4. To differentiate and demonstrate the types in Thread creation and Exception Handling
5. To Create the Applet Programming and apply the Collection Framework.

**UNIT I** **15 Hrs**

**JAVA EVOLUTION** : Java History – Java Features – How Java Differs from C and C++ -- Java and Internet – Java and World Wide Web – Web Browsers – Hardware and Software Requirements– Java Support Systems – Java Environment.

**OVERVIEW OF JAVA LANGAGE** : Introduction – Simple Java Program – More of Java – An Application with Two Classes – Java Program Structure – Java Tokens – Java Statements – Implementing a Java Program – Java Virtual Machine – Command Line Arguments – Programming Style - **TYPE CONVERSION IN EXPRESSION-DECISION MAKING AND BRANCHING :** Introduction – Decision Making with If Statement – Simple If Statement – The If ..Else Statement – Nesting of If..Else Statements – The Else If Ladder – The Switch Statement –The ? : Operator.

**Extra Reading /Keywords:** *Netbean, Eclipse*

**UNIT II** **15 Hrs**

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

**Extra Reading /Keywords:** *Generalization, Specialization*

**UNIT III** **15 Hrs**

**INTERFACES: MULTIPLE INHERITANCE:** Introduction – Defining Interfaces – Extending Interfaces – Implementing Interfaces – Accessing Interface Variables.

**PACKAGES : PUTTING CLASSES TOGETHER :** Introduction – Java API Packages – Using System Packages – Naming Conventions – Creating Packages – Accessing a Package – Using a Package – Adding a Class to a Package – Hiding Classes – Static Import.

**Extra Reading /Keywords:** *Proxy, JAR Files.*

**UNIT IV** **15 Hrs**

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

**Extra Reading /Keywords:** *Deadlock, Synchronization*

**UNIT V** **15 Hrs**

**MANAGING INPUT/OUTPUT FILES IN JAVA :** Introduction – Concept of Streams – Stream Classes – Byte Stream Class- Character Stream Classes –Using Streams – Other useful I/O Classes – Using the File Class – Input/Output Exceptions – Creation of Files – Reading/Writing Characters – Reading/Writing bytes – Handling primitive Data Types – Concatenation and Buffering Files – Random Access Files – Interactive Input and Output.

**Extra Reading /Keywords:** *Swing, AWS*

**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 – K5) |
|---|---|---|
| **CO-1** | State OOPS and Relate java syntax with c and C++. | K1 |
| **CO-2** | Categorize encapsulation, abstraction, polymorphism and inheritance | K2 |
| **CO-3** | Apply encapsulation concepts in developing the programs with classes and objects with interfaces and packages | K3 |
| **CO-4** | Identify the concepts of threads, errors and exceptions | K4 |
| **CO-5** | Construct applications using Java collections | K5 |

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

## TEXT BOOK

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

## SUGGESTED READINGS


1. Herbert Schildt, **"Java The Complete Reference"**, 10th edition, Tata McGraw-Hill Publications Pvt. Ltd., New Delhi, 2017.
2. Kathy Sierra, Trisha Gae & Bert Bates, **"Head First Java"**, 10th edition, O-Reilly ,2022.
3. Cay S. Horstmann,"**Core Java : Volume I – Fundamentals"**, 12th edition,Addison-Wesley Professional, 2022.
4. Joshua Bloch, **"Effective Java"**, 3rd edition, Addison Wesley Publications, 2018.
5. Nathan Clark, **"JavaScript: Programming B",** 2ndedition, 2018.


## WEB REFERENCES

1. https://www.javatpoint.com/java-tutorial
2. https://docs.oracle.com/javase/tutorial/
3. https://www.w3schools.com/java
4. https://www.tutorialspoint.com/java/index.htm
5. https://www.geeksforgeeks.org/java/

***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 | 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 |

## 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 2022-23 onwards)**

| | |
|---|---|
| **Course Title** | **Major Core - 10 - JAVA PROGRAMMING – LAB** |
| **Code** | **U22CA4MCP10** |
| **Course type** | **Practical** |
| **Semester** | **IV** |
| **Hours/Week** | **4** |
| **Credits** | **4** |
| **Marks** | **100** |

## CONSPECTUS

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

## COURSE OBJECTIVES

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. FILES.

**COURSE OUTCOMES**

**The Learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level (K1 – K5) |
|---|---|---|
| **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 2022-23 onwards)**

| | |
|---|---|
| **Course Title** | **Major Elective – 2: ETHICAL HACKING** |
| **Code** | **U22CA4MET03** |
| **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**

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

**UNIT I** **12 Hrs**

Introduction to Computers - Classification of Digital Computer - Introduction to Computer Software - Programming Language – Operating Systems - Introductionto Database Management System.

**Extra Reading/ Keywords:** *Generation of computers, DDL, DML*

**UNIT II** **12 Hrs**

Computer Networks - WWW and Internet – Email - Computers at Home, Education, Entertainment, Science, Medicine and Engineering - Introduction to Computer Security - Computer Viruses, Bombs, Worms.

**Extra Reading/ Keywords:** *Malware, Ransomware, Adware*

**UNIT III** **12 Hrs**

**INTRODUCTION:** Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable and Integration.

**Extra Reading/ Keywords:** *Cyber Activism, Cyber Terrorism, Data Breaches*

**UNIT IV** **12 Hrs**

**INFORMATION SECURITY MODELS:** Computer Security, Network Security, Service Security, Application Security, Information Security Program: The Process of Information Security, Security Programs, Risk Analysis and Ethical Hacking.

**Extra Reading/ Keywords:** *Hacktivism, Pandemic-related Attack.*

**UNIT V** **12 Hrs**

**THE BUSINESS PERSPECTIVE:** Business Objectives, Security Policy, Previous Test Results, Business Challenges Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Multi-Phased Attacks: Types.

**Extra Reading/ Keywords:** *Firewall, Anti _Virus softwares*

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

## COURSE OUTCOMES

**The Learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level (K1 – K5) |
|---|---|---|
| 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 applythe suitable solution for them. | K5 |

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

## TEXT BOOKS


1. Fundamentals ofInformation 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 READINGS


1. Fundamentals ofComputers and Information Technology, M.N Doja, 2005.
2. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning,Second Edition , 2016.
3. MichaelSimpson, Kent Backman, James Corley, "Hands-On Ethical Hacking And Network Defense", Cengage Learning, 2010.
4. KimberlyGraves, "Certified Ethical Hacker", WileyIndia Pvt Ltd, 2010.
5. Rajat Khare, "Network Securityand Ethical Hacking", Luniver Press, 2006.


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

## WEB REFERENCES

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 2022-23 onwards)**

| | |
|---|---|
| **Course Title** | **Major Elective - 2 : WEB TECHNOLOGY** |
| **Code** | **U22CA4MET04** |
| **Course Type** | **Theory** |
| **Semester** | **IV** |
| **Hours/Week** | **4** |
| **Credits** | **3** |
| **Marks** | **100** |

## CONSPECTUS

To understand the foundational elements of Web architecture and apply the concepts of JavaScript with HTML, CSS and XML scripts to develop modern and functional web applications.

## COURSE OBJECTIVES

1. To enrich foundational knowledge about the internet, the World Wide Web, and HTML as the primary markup language for creating web content.
2. To understand CSS fundamentals, selectors, properties, layout techniques, responsiveness, and styling methodologies to design visually appealing and responsive web pages.
3. To provide a comprehensive understanding of XML's syntax, including elements, attributes, namespaces, and document structure, to create well-formed and valid XML documents.
4. To explain JavaScript basics, including variables, data types, control structures, functions, and object-oriented programming concepts for web interactivity.
5. To understand and deliver the Document Object Model (DOM) and its manipulation using JavaScript to dynamically interacts with HTML and CSS for creating responsive web pages.

**UNIT I** **12 Hrs**

**Introduction to the Web**: Understanding the Internet and WWW – History of the Web - Web Architecture – Web Browsers – Web Servers.

**Hyper Text Markup Language (HTML)**: HTML Basics – Elements, Attributes and Tags – Basic Tags. **Advanced Tags**: Table Tags, Nested Tables, Forms and Form Elements – Frames – Images – Meta Tag – Planning of Web Page – Model and Structure for a Website – Designing Web Pages – Multimedia Content Frames.

***Extra Reading /Key words:*** *HTML Classes*

**UNIT II** **12 Hrs**

**Cascading Style Sheet (CCS**): Introduction – Advantages – Adding CSS – Browser Compatibility – CSS and Page Layout – Selectors.

***Extra Reading /Key words:*** *CSS Text Transform*

**UNIT III** **12 Hrs**

**Extensible Markup Language (XML):** Common usage – Role of XML – Prolog - Body - Elements - Attributes – Validation - Displaying XML – Namespace - Document type Definition - XML Schema - Document object model.

***Extra Reading /Key words:*** *XML Tree*

**UNIT IV** **12 Hrs**

**JavaScript**: Introduction – Variables – Literals – Operators – Control Structure – Conditional Statements - Arrays – Functions.

***Extra Reading /Key words:*** *JavaScript Oops*

**UNIT – V** **12 Hrs**

**JavaScript and HTML DOM**:

Objects - Window Object - Event Handlers - Event Object - Form Object and Element - Data Entry and Validation – Tables and Forms.

***Extra Reading /Key words:*** *JavaScript Exception Handling*

## TEXT BOOKS

1. Uttam K. Roy, **"Web Technologies"**, Oxford UP, New Delhi, 2016.

**UNIT I:** Chapter 1 (1.1, 1.11, 1.13, 1.14)
Chapter 4 (4.3 – 4.13)
**UNIT II:** Chapter 5
**UNIT III:** Chapter 6
**UNIT IV:** Chapter 13 (13.1 – 13.8)
**UNIT V:** Chapter 13 (13.9)
Chapter 14 (14.1, 14.1.1, 14.5, 14.5.1)
Chapter 15 (15.1, 15.3, 15.4)

## SUGGESTED READINGS


1. Kumar, Akshi, **"Web Technology: Theory and Practice"**, United States, CRC Press, 2018
2. Foster, Jo, **"HTML & CSS for Beginners: Learn the Fundamentals of Computer Programming"**, Amazon Digital Services LLC - KDP Print US, 2020.
3. Harris, Patricia, **"What Is HTML Code?"**, United States, PowerKids Press, 2017.
4. Meloni, Julie. PHP, **"MySQL & JavaScript All in One, Sams Teach Yourself"**, United Kingdom, Pearson Education, 2017
5. Craig, Berg, **" JavaScript: JavaScript Programming Made Easy for Beginners & Intermediates (Step By Step With Hands On Projects)"**, United States, Antony Mwau, 2019.


## WEB REFERENCES

1. https://www.w3schools.com/html/
2. https://www.w3schools.com/css/default.asp
3. https://www.w3.org/XML/
4. https://www.w3schools.com/js/default.asp
5. https://www.javatpoint.com/html-tutorial

## COURSE OUTCOMES

**The Learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level (K1 – K5) |
|---|---|---|
| CO-1 | Explain the various key terms and fundamental concepts of WWW; acquire the knowledge of HTML basic and advanced tags. | K1 |
| CO-2 | Understand the concept of HTML with CSS Scripts to design the Web page. | K2 |
| CO-3 | Apply DTDs for simple XML document. | K3 |
| CO-4 | Analyze and interact web pages using JavaScript.. | K4 |
| CO-5 | Evaluate the Dynamic Web Pages using HTML and JavaScript for real world problems. | 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 | L | L | L | L | M | M | L | M |
| **CO-2** | L | L | M | L | L | L | M | L | L |
| **CO-3** | L | L | L | M | L | L | M | M | L |
| **CO-4** | L | L | L | M | L | M | M | L | L |
| **CO-5** | L | L | L | M | L | L | M | L | M |

**PSO – CO MAPPING**

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

**(For Candidates admitted from the academic year 2022-23 onwards)**

| | |
|---|---|
| **Course Title** | **Non Major Elective -1: BASIC DRAWING AND EDITING – LAB** |
| **Code** | **U22CA4NMP02** |
| **Course type** | **Practical** |
| **Semester** | **IV** |
| **Hours/Week** | **2** |
| **Credits** | **2** |
| **Marks** | **100** |

**CONSPECTUS**

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 thetechniques for resize and crop images;
5. To understand the concepts to remove or repair unwanted image areas.

**EXERCISES**

1. Simple letter Logos
2. Carved wood Effect
3. To change the Gradient Color
4. Create a cool abstract line
5. Wrap text into the shape ofan object
6. Easy text offsets
7. Cutting outline inthe 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-K5) |
|---|---|---|
| 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)**

**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 from June 2021-2022 onwards)**

| | |
|---|---|
| **Course Title** | **Allied – 6: RELATIONAL DATABASE MANAGEMENT SYSTEM** |
| **Code** | **U22CA4ALT06** |
| **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

**The Learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level (K1 – K5) |
|---|---|---|
| **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"**, 2019, Seventh Edition, McGraw-Hill Publications. New Delhi. (UNIT I, UNIT II, UNIT III)
2. Coronel, Morris, Rob, **"Database Systems, Design, Implementation and Management"**, 12th Edition, 2017


## SUGGESTED READINGS


1. Ramez Elmasri, Shamkant B. Navathe, **"Fundamentals of Database Systems"**, 2017, 7e, Pearson Publications, New Delhi.
2. Ivan Bayross ,**"SQL PL/SQL - The Programming Language Of Oracle"**, BPB Publications, 2018
3. Benjamin Rosenzweig **, "Oracle Pl/SQL by Example"**, 5th Edition, Pearson India Ltd, 2017
4. Murach, **" Oracle SQL and PL/SQL for Developers"**, 2019, Fifth Edition,
5. Steven Feuerstein, Bill Pribyl, **"Oracle PL/SQL Programming"**, 2014, Sixth Edition, O' Reilly Publications, USA. (UNIT V)


## WEB REFERENCES

1. https://www.techopedia.com/
2. https://www.geeksforgeeks.org/relational-model-in-dbms/
3. https://www.javatpoint.com/dbms-relational-model-concept
4. https://learn.microsoft.com/en-us/office/troubleshoot/access/database-normalization-description
5. https://www.tutorialspoint.com/sql/sql-overview.htm

**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** | H | H | H | H | H | - | 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 2022-23 onwards)**

| | |
|---|---|
| **Course Title** | **Allied – 5 : PROGRAMMING IN C (PHYSICS)** |
| **Code** | **U22CA4ALT07** |
| **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**

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 filesin 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 doStatement – 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**

**The learner will be able to**

| CO No. | Course Outcomes | Cognitive Level (K1 – K5) |
|---|---|---|
| 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 theconcepts 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 tosolve the problemusing C effectively | K4 |
| CO-5 | Evaluate the performance of the C Programfor the givenscenario using the various constructs of C Language. | K5 |

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

## TEXT BOOKS


1. M. T. Somashekara, **"Problem Solving with C"**, PHI Learning Private Limited, 2018.
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, 2017.
2. Deitel and Deitel, **"C How to Program"**, Seventh Edition, Pearson Education Pvt. Ltd., 2018.
3. Herbert Schildt, **"The Complete Reference C"** , Fourth edition, McGraw Hill Education Private Limited, 2017,
4. Yashavant Kanetkar, **"Let Us C solutions"**, 15th Edition, BPB publications, India, 2017.
5. K R Venugopal ,Sudeep R Prasad, **"Mastering C"**, Second Edition, McGraw Hill Education Private Limited, 2017.


## WEB REFERENCES

1. https://www.lessons2all.com/c_decision_making_looping.php
2. https://www.geeksforgeeks.org/strings-in-c/
3. https://www.w3schools.com/java/java_arrays.asp
4. https://www.geeksforgeeks.org/what-is-array/
5. https://www.geeksforgeeks.org/structures-unions-and-enumerations-in-cpp/

## 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 2022-23 onwards)**

| | |
|---|---|
| **Course Title** | **Allied – 6 : PROGRAMMING IN C - LAB (PHYSICS)** |
| **Code** | **U22CA4ALP08** |
| **Course Type** | **Practical** |
| **Semester** | **IV** |
| **Hours/Week** | **4** |
| **Credits** | **2** |
| **Marks** | **100** |

## CONSPECTUS

To writecode 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 applythe 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. To understand the concepts of strings, user defined functions, structures, union, pointers and files in C

## EXERCISES

1. To perform basic arithmetic operations.
2. Finding the factorial of a number.
3. Finding solution for equations in Physics.
4. Checking whether a number is odd or even.
5. Finding the largest of three numbers.
6. Finding the largest and smallest element inan array.
7. To perform matrix multiplication.
8. To generatethe Fibonacci series.
9. To prepare mark sheet using looping statement.
10. To prepare payroll using looping statement.

## COURSE OUTCOMES

**The learner will be able to**

| CO No. | Course Outcomes | Cognitive Level (K1 – K5) |
|---|---|---|
| **CO-1** | Recall the fundamental concepts of C using Simple Programs | K1 |
| **CO-2** | Develop a simple programusing the operators, arrays. | K2 |
| **CO-3** | Applythe 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 from the academic year 2022-23 onwards)**

| Course Title | Allied – 6: PROGRAMMING CONCEPTS FOR BIOTECHNOLOGY |
|---|---|
| Code | U22CA4ALT09 |
| Course type | Theory |
| Semester | IV |
| 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 make students understand the concepts of python programming
2. To apply the OOPs concept in python programming.
3. To understand and analyze the python features and Program Structure.
4. To acquire programming skills in scripting language.
5. To apply Structured Query Language to access data from database.

## UNIT I — 12 Hrs

**BASICS OF PYTHON PROGRAMMING:** History of Python-Features of Python-Literal-Constants- Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements- Comments – Indentation- Operators-Expressions-Type conversions.

**Extra Reading /Key words:** *Type Casting, Type Coercion*

## UNIT II — 12 Hrs

**PYTHON ARRAYS:** Defining and Processing Arrays – Array methods. **CONTROL STATEMENTS:** Selection/Conditional Branching statements: if, if-else, nested if and if- elif-else statements. **ITERATIVE STATEMENTS:** while loop, for loop, else suite in loop and nested loops**. JUMP STATEMENTS:** break, continue and pass statements.

**Extra Reading /Key words:** *The else statement used with loops*

## UNIT III — 12 Hrs

**FUNCTIONS:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. **PYTHON STRINGS:** String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison.

**Extra Reading/Key words:** *Packages in Python*

**UNIT IV** **12 Hrs**

**INTRODUCTION TO SCRIPTING LANGUAGE:** What is HTML - HTML Documents -Basic structure of an HTML document - Creating an HTML document - Mark up Tags - Heading-Paragraphs - Line Breaks - HTML Tags-Introduction to elements of HTML - Working with Text - Working with Lists, Tables and Frames - Working with Hyperlinks, Images.

**Extra Reading /Key words:** *SGML Concepts.*

**UNIT V** **12 Hrs**

**INTRODUCTION TO DATABASES AND TRANSACTIONS**: What is database system, purpose of database system, view of data, relational databases, database architecture. **SQL & BASIC COMMANDS:** SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, UPDATE,ALTER, MODIFY & Select –commands.

**Extra Reading /Key words:** *Navigational Database, Integrated Data Store (IDS).*

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

## COURSE OUTCOMES

**The learner will be able to:**

| CO No. | Course Outcomes | Cognitive Level (K1-K5) |
|---|---|---|
| **CO-1** | Learn the basics of python, do simple programs on python, Learn how to use an array. | K1 |
| **CO-2** | Develop program using selection statement, Work with Looping and jump statements, do programs on Loops and jump statements. | K2 |
| **CO-3** | Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions and strings. | K3 |
| **CO-4** | Construct and develop the websites for medium and large real time applications for various domains | K4 |
| **CO-5** | Evaluate the syntax, semantics and performance of various concepts in python programming and Sql Commands. | K5 |

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

## TEXT BOOKS


1. Reema Thareja, **"Python Programming using problem solving approach"**, First Edition, Oxford University Press, 2017.
2. Kogent Learning Solutions Inc. **"HTML 5 in simple steps"**, Dreamtech Press, 2010.
3. Abraham Silberschatz, Henry F.Korth and S.Sudarshan**, "Database System Concepts"**,,VI Edition, McGraw Hill International Publication, 2019

## SUGGESTED READINGS


1. Vamsi Kurama, **"Python Programming: A Modern Approach"**, Pearson Education, 2018.
2. Mark Lutz, **"Learning Python"**, Orielly Publications Pvt. Ltd, 2019.
3. Maurice J Thompson, **"Python Programming: Your Beginner Guide To Learn Python in 7 Days"**, White flower Publishing Pvt. Ltd., 2020.
4. G.K.Gupta , **"Database Management System"**, Tata McGraw Hill Publications Company Limited, New Delhi 2011.
5. Seemakedar, **"Database Management System"**, Technical Publication 2011.


## WEB REFERENCES

1. https://www.programiz.com/python-programming
2. https://www.guru99.com/python-tutorials.html
3. https://www.w3schools.com/python/python_intro.asp
4. https://html.com/
5. http://lgatto.github.io/sql-ecology/01-sql-basic-queries.html

**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 | 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 |
| **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 | M |
| **CO-4** | H | H | H |
| **CO-5** | H | H | H |

**(For Candidates admitted from the academic year 2022-23 onwards)**

| | |
|---|---|
| **Course Title** | **Allied – 7: PROGRAMMING CONCEPTS FOR BIOTECHNOLOGY - LAB** |
| **Code** | **U22CA4ALP10** |
| **Course type** | **Practical** |
| **Semester** | **IV** |
| **Hours/Week** | **4** |
| **Credits** | **2** |
| **Marks** | **100** |

## CONSPECTUS

Student use SQL to get biological data, process and store it in a database; Analyze and visualize the processed data via applications written using python and display the analyzed data using HTML.

## COURSE OBJECTIVES

1. Be able to design and program Python applications.
2. Be able to create loops and decision statements in Python.
3. Be able to work with functions and pass arguments in Python
4. To acquire programming skills in scripting language.
5. To comprehend the differences between typical scripting languages and application programming languages
6. To understand to create and manipulate tables using sql queries

## EXERCISES

1. Program using variables, constants, I/O statements in Python.
2. Program using Operators in Python.
3. Program using Conditional Statements.
4. Program using Loops.
5. Program using Functions.
6. Program using Arrays.
7. Program using Strings.

## 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.
2. Writing Basic SQL SELECT Statements.
3. Writea sql statement for implementing retrieval queries.
4. Use ALTER, MODIFY.

## 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** | 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 |
| **CO-5** | Evaluate the Student Mark list using Sql Queries | 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 | L | L | L | M | M | M | M |
| **CO-2** | H | H | M | H | L | M | M | M | M |
| **CO-3** | H | H | M | H | H | M | M | M | M |
| **CO-4** | H | H | M | H | H | M | H | H | M |
| **CO-5** | H | H | M | H | H | M | 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 |
| **CO-5** | M | M | M |