

**SCHOOL OF MATHEMATICAL
COMPUTATION SCIENCES**

**PG DEPARTMENT OF COMPUTER
APPLICATIONS**

**BCA
2023 - 2024**



(For Candidates admitted from the academic year 2023-24 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 professional in various fields.
- PO 9** – Apply the mathematical techniques and software tools to draw the solution in complex and dynamic multidisciplinary scenario.

Programme Specific Outcomes (PSOs)

- PSO 1** – Apply programming skills in the areas of Software Development, Networking and Emerging Technologies.
- PSO 2** - Develop Employability Computational skills for technological progress.
- PSO 3** - Create innovative career paths in software development for independent and professional up skilling in the ever changing Digital era.

(For Candidates admitted from June 2023 onwards)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI - 2
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
UG COURSE PATTERN – TANSCHÉ
B.C.A.

Semester	Part	Subject	CODE	Hours	Credits	Marks	
I	I	General Tamil – I/ Hindi Paper – I/ French Paper – I	U23TL1GEN01/ U23HN1HIN01/ U23FR1FRE01	6	3	100	
	II	General English – I	U23EL1GEN01	6	3	100	
	III	Core Course 1: Python Programming		U23CA1CCT01	5	5	100
		Core Course 2: Python Programming -Lab		U23CA1CCP02	5	5	100
		Elective-1 (Generic): Statistical Methods and its Applications		U23MA1ECT01	4	3	100
	IV	SEC1(NME1): Introduction to HTML-Lab		U23CA1SEP01	2	2	100
		Foundation Course: Structured Programming in C		U23CA1FCT01	2	2	100
	Total				30	23	700
II	I	General Tamil – II/ Hindi – II/ French – II	U23TL2GEN02/ U23HN2HIN02/ U23FR2FRE02	5	3	100	
	II	General English – II	U23EL2GEN02	5	3	100	
	III	Core Course 3: Object Oriented Programming Concepts using C++		U23CA2CCT03	6	5	100
		Core Course 4: C++ Programming – Lab		U23CA2CCP04	5	5	100
		Elective Course – 2 (Generic): Numerical Methods		U23MA2ECT03	4	3	100
	IV	SEC 2 (NME 2): Open Source Technologies		U23CA2SET02	2	2	100
		SEC 3:Sustainable Rural Development and Student Social Responsibility		U23RE2SET03	2	2	100
		Internship / Field Work / Field Project 30 Hours - Extra Credit		U23EX2INT01	-	2(EC)	100
		Massive Open Online Course (MOOC)		U23EX2ONC01		2 (EC)	100
		Value Education: Ethics I/ Bible Studies I/ Catechism I		U23VE2LVE01/ U23VE2LVB01/ U23VE2LVC01	1	-	100
Total				30	23 + 4	800+200	
III	I	General Tamil – III/ Hindi Paper – III/ French Paper – III	U23TL3GEN03/ U23HN3HIN03/ U23FR3FRE03	5	3	100	
	II	General English – III	U23EL3GEN03	5	3	100	
	III	Core Course 5: Data Structures and Algorithms		U23CA3CCT05	6	5	100
		Core Course 6: Data Structures and Algorithms – Lab		U23CA3CCT06	6	5	100
		Elective 3 (Generic): Financial Accounting		U23CC3ECT07	4	3	100
	IV	SEC 4 (Entrepreneurial Skill): Enterprise Resource Planning		U23CA3SET04	2	2	100
		SEC 5 : Industrial Relations		U23CA3SET05	1	1	100
		Massive Open Online Course (MOOC)		U23EX3ONC02		2 (EC)	100
		Value Education			1	-	
	Total				30	22+2	700+100

IV	I	General Tamil – IV/ Hindi Paper – IV/ French Paper – IV	U23TL4GEN04/ U23HN4HIN04/ U23FR4FRE04	5	3	100	
	II	General English – IV	U23EL4GEN04	5	3	100	
	III	Core Course 7 : Programming in Java		U23CA4CCT07	5	5	100
		Core Course 8 : Programming in Java – Lab		U23CA4CCP08	5	5	100
		Elective 4 (Generic): Cost and Management Accounting		U23CC4ECT10	3	3	100
	IV	SEC 6: Multimedia Systems		U23CA4SET06	2	2	100
		SEC 7 : Robotics and Applications		U23CA4SET07	2	2	100
		EVS		U23ES4EVS01	2	2	100
		Value Education: Ethics I/ Bible Studies I/ Catechism I		U23VE4LVE01/ U23VE4LVB01/ U23VE4LVC01	1	-	100
	Internship / Field Work / Field Project 30 Hours - Extra Credit		U23EX4INT02		2(EC)	100	
	Total			30	25+ 2	900+100	
V	III	Core Course 9: Operating System		U23CA5CCT09	5	4	100
		Core Course 10: ASP.Net Programming		U23CA5CCT10	5	4	100
		Core Course 11: ASP.Net Programming – Lab		U23CA5CCP11	5	4	100
		Core Course 12: Computer Networks		U23CA5CCT12	6	4	100
		Elective 5: Graph Theory and its Applications (Offered by Maths) / Introduction to Machine Learning (Offered by CS)		U23MA5ECT11/ U23CS5ECT05	4	3	100
		Elective 6: Software Project Management/ Cloud Computing		U23CA5ECT02/ U23CA5ECT03	4	3	100
		Value Education		U23VE5LVE01 U23VE5LVC01 U23VE5LVB01	1	-	100
		Internship / Field Work / Field Project 30 Hours - Extra Credit		U23EX5INT03	-	2	100
	Total			30	24	800	
VI	III	Core Course 13: Data Analytics using R Programming		U23CA6CCT13	6	4	100
		Core Course 14: R Programming-Lab		U23CA6CCT14	6	4	100
		Core Course 15: (Project with Viva Voce)		U23CA6DIS01	5	4	100
		Elective 7: Optimization Techniques (Offered by Maths) / Introduction to Artificial Intelligence (Offered by CS) /		U23MA6ECT14/ U23CS6ECT08	5	3	100
		Elective 8: IOT and its Applications/ Big Data Analytics		U23CA6ECT05/ U23CA6ECT06	5	3	100
	IV	SEC 8: Professional Competency Skill Enhancement Course		U23CA6SET08	2	2	100
		Extension Activity (Service Oriented Course)		U23EA6SOC01	-	1	100
		Value Education		U23VE6LVE02 U23VE6LVC02 U23VE6LVB02	1	2	100
	RESCAPES - Impact study of Project		U23EX6RES01	-	2 (EC)	100	
	Total			30	23+2	800+100	
	Grand Total			180	140+10	4700+500	

SEC: SKILLED ENHANCEMENT COURSE**NME: NON MAJORELECTIVE****ELECTIVE COURSES OFFERED BY THE DEPARTMENT**

Semester	Part	Subject	Code	Hours	Credits	Marks
V	III	Elective 5: R Programming [Offered to CS & MATHS]	U23CA5ECT01	4	3	100
VI	III	Elective 7: Cloud Computing and its Applications [Offered to CS & MATHS]	U23CA6ECT04	5	3	100

NME COURSES OFFERED BY THE DEPARTMENT

Semester	Part	Subject	Code	Hours	Credits	Marks
I	III	NME 1 : Introduction to HTML- Lab	U23CA1SEP01	2	2	100
II	IV	NME 2: Open Source Technologies	U23CA2SET02	2	2	100

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HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS,
PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA - First Year - Semester – I

Course Title	Core Course 1 : Python Programming
Code	U23CA1CCT01/ U23CS1CCT01
Course type	Theory
Semester	I
Hours/Week	5
Credits	5
Marks	100

CONSPECTUS

To understand the use of python programming to solve problems of different domains.

COURSE OBJECTIVES

1. To make students understand the concepts of Python programming
2. To apply the OOPs concept in PYTHON programming.
3. To impart knowledge on demand and supply concepts
4. To make the students learn best practices in PYTHON programming
5. To know the costs and profit maximization

UNIT I

18 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. **Python Arrays:** Defining and Processing Arrays – Array methods.

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

UNIT II

18 Hrs

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

18 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. **Modules:** import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.

Extra Reading /Key words: *Packages in Python*

UNIT IV**18 Hrs**

Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.

Extra Reading /Key words: *String formatting with dictionaries*

UNIT V**18 Hrs**

Python File Handling: Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.

Extra Reading /Key words: *Directory methods, Creating Hash file*

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-K4)
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, Strings and modules.	K3
CO-4	Work with List, Tuples, Dictionary and usage of File handlings that is reading and writing files. Do programs for List, Tuple, Dictionary and files.	K4

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

TEXT BOOKS

1. Reema Thareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press.
2. Dr. R. Nageswara Rao, “Core Python Programming”, First Edition, 2017, Dream tech Publishers.

SUGGESTED READINGS

1. VamsiKurama, “Python Programming: A Modern Approach”, Pearson Education.
2. Mark Lutz, ”Learning Python”, Orielly.
3. Adam Stewarts, “Python Programming”, Online.
4. Fabio Nelli, “Python Data Analytics”, APress.
5. Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication.

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://www.geeksforgeeks.org/python-programming-language/>
5. [https://en.wikipedia.org/wiki/Python_\(programming_language\)](https://en.wikipedia.org/wiki/Python_(programming_language))

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	L	L	M	M	H	M	M	M	M
CO 2	L	M	M	M	H	H	H	H	H
CO 3	M	M	M	M	H	H	H	H	H
CO 4	M	M	M	M	H	H	H	H	H

PSO – CO MAPPING

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

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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 - First Year - Semester – I

Course Title	Core Course 2: Python Programming - Lab
Code	U23CA1CCP02
Course type	Practical
Semester	I
Hours/Week	5
Credits	5
Marks	100

CONSPECTUS

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

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. Be able to build and package Python modules for reusability.
5. Be able to read and write files in Python programs for creating a file and perform I/O operation on files.

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 Jump Statements.
6. Program using Functions.
7. Program using Recursion.
8. Program using Arrays.
9. Program using Strings.
10. Program using Modules.
11. Program using Lists.
12. Program using Tuples.
13. Program using Dictionaries.
14. Program for File Handling

COURSE OUTCOMES

The Learner will be able to:

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

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

PO – CO MAPPING

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

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

(For Candidates admitted in the academic year 2023-2024)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA - First Year - Semester – I

Course Title	SEC 1 (NME 1): Introduction to HTML - Lab
Code	U23CA1SEP01
Course type	Practical
Semester	I
Hours/Week	2
Credits	2
Marks	100

CONSPECTUS

To understand the fundamentals of HTML and build a first web page using HTML and also to understand the usage of tables to create a layout of a web page

COURSE OBJECTIVES

1. Insert a graphic within a web page.
2. Create a link within a web page.
3. Create a table within a web page.
4. Insert heading levels within a web page.
5. Insert ordered and unordered lists within a web page. Create a web page.

EXERCISES

1. Heading Levels using HTML
2. Text Formatting using HTML
3. Ordered and Unordered List using HTML
4. Creating Tables using HTML
5. Insert image and Adding effect using HTML
6. Develop an Application Form using HTML
7. Design a webpage using HTML
8. Creating links in HTML.
9. Profile creation using HTML
10. Creating Frames using HTML

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-K4)
CO-1	Knows the basic concept in HTML. Concept of resources in HTML.	K1
CO-2	Knows Design concept. Concept of Meta Data. Understand the concept of save the files.	K2
CO-3	Understand the page formatting. Concept of list.	K3
CO-4	Creating Links. Know the concept of creating link to email Address	K4

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

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

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

(For Candidates admitted in the academic year 2023-2024)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI-620002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES – BASED CURRICULUM FRAMEWORK (LOCF)
BCA- First Year- Semester-I

Course Title	Foundation Course: Structured Programming in C
Code	U23CA1FCT01
Course type	Theory
Semester	1
Hours/Week	2
Credits	2
Marks	100

CONSPECTUS

To developing programming skills using C language involves understanding problem-solving approaches.

COURSE OBJECTIVES

1. To familiarize the students with the Programming basics and the fundamentals of C, Data types in C, Mathematical and logical operations.
2. To understand the concept using if statements and loops
3. This unit covers the concept of Arrays
4. This unit covers the concept of Functions
5. To understand the concept of implementing pointers.

UNIT I

6Hrs

Overview of C: Importance of C, sample C program, C program structure, executing C Program. Constants, Variables, and Data Types: Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, Assigning values to variables--- Assignment statement, Operators and Expressions.

Extra Reading/Keywords: *Basic I/O and control operations in C language.*

UNIT II

6Hrs

Decision Making and Branching: Decision making with If, simple IF, IF ELSE, nested IF ELSE, ELSE IF ladder, switch, GOTO statement. **Decision Making and Looping:** While, Do-While, For, Jumps in loops.

Extra Reading/Keywords: *Develop C programs using control structures.*

UNIT III

6Hrs

Arrays: Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays.

Extra Reading/Keywords: *Develop multidimensional array programs with branching and looping constructs.*

UNIT IV**6 Hrs**

Functions: The form of C functions, Return values and types, calling a function, categories of functions, Nested functions, Recursion, call by value, call by reference.

Extra Reading/Keywords: *Create Programs using functions, structures and unions.*

UNIT V**6 Hrs**

Pointers: definition, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor.

Extra Reading/Keywords: *Develop C programs using pointers and arrays.*

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-K3)
CO-1	Remember the program structure of C with its syntax and semantics	K1
CO-2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	K2
CO-3	Apply the programming principles learnt in real-time Problems	K3

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

TEXT BOOKS

1.E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010.

SUGGESTED READINGS

1. Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.
2. Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998.
3. Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications, 2021.

WEB REFERENCES

1. <https://codeforwin.org/>
2. <https://www.geeksforgeeks.org/c-programming-language/>
3. <http://en.cppreference.com/w/c>
4. <http://learn-c.org/>
5. <https://www.cprogramming.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	L	L	M	M	M	L	M	M	M
CO 2	M	M	L	L	M	M	H	H	H
CO 3	H	H	M	M	L	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

(For Candidates admitted in the academic year 2023-2024)

Course Title	Core Course 3 : OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++
Code	U23CA2CCT03
Course type	Theory
Semester	II
Hours/Week	6
Credits	5
Marks	100

CONSPECTUS

To understand the basic concepts of C++ programming and apply the concepts to solve problems of different domains.

COURSE OBJECTIVES

1. To describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
2. To understand dynamic memory management techniques using pointers, constructors, destructors, etc.
3. To describe the concept of function overloading, operator overloading, virtual functions and polymorphism.
4. To classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.
5. To demonstrate the use of various OOPs concepts with the help of programs.

UNIT I

15 Hrs

INTRODUCTION TO C++ - key concepts of Object-Oriented Programming –Advantages–Object Oriented Languages–I/O in C++ - C++ Declarations. **CONTROL STRUCTURES:- DECISION MAKING AND STATEMENTS:** If ..else, jump, go to, break, continue, Switch case statements - **LOOPS IN C++ :** for, while, do - functions in C++ - inline functions – Function Overloading.

Extra Reading /Keywords: *Data Conversion.*

UNIT II

15 Hrs

CLASSES AND OBJECTS: Declaring Objects – Defining Member Functions –Static Member variables and functions–array of objects–friend functions – Overloading member functions – Bit fields and classes –Constructors: Parameterized Constructor – Constructor with default arguments – Copy Constructor and destructor.

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

UNIT III

15 Hrs

OPERATOR OVERLOADING: Overloading unary, binary operators–Overloading Friend functions –type conversion – **INHERITANCE:** Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid –Virtual base Classes–Abstract Classes.

Extra Reading /Keywords: *Member classes , Nesting of classes*

UNIT IV

15 Hrs

POINTERS: Introduction – Declaring and initializing Pointers –Pointer to Class, Object – this pointer – Pointers to derived classes - Virtual Functions. **MANAGING CONSOLE I/O OPERATIONS:** Unformatted I/O Operations – formatted Console I/O Operations – Managing output with Manipulators.

Extra Reading /Keywords: *Local Classes.*

UNIT V

15 Hrs

Files: File stream classes –file modes–Sequential Read /Write operations–Exception Handling.

STRING: Introduction – Creating string objects–String Characteristic – Comparing and Swapping.

Extra Reading /Keywords: *Member function Templates, Non-Type Template Argument.*

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-K4)
CO-1	Remember the program structure of C++ with its syntax and semantics.	K1
CO-2	Understand the programming principles in C++. (datatypes, operators, branching and looping, arrays, functions, structures, pointers and files)	K2
CO-3	Apply the programming principles learnt in real- Time problems	K3
CO-4	Analyze the various methods of solving a problem and choose the best method.	K4

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

TEXT BOOK

1. E. Balagurusamy, “**Object-Oriented Programming with C++**”, 8th Edition, Tata McGraw Hill, 2022.

SUGGESTED READINGS

1. Jeganathan Swaminathan, “**Mastering C++ Programming**”, Packt Publishing Ltd, 2017.
2. Behrouz A. Forouzan, Richard Gilberg, “**Loose Leaf for C++ Programming: An Object-Oriented Approach**”, 2019
3. Grimes, Richard, “**Beginning C++ Programming**”. United Kingdom, Packt Publishing, 2017.
4. Lospinoso, Josh., “**C++ Crash Course: A Fast-Paced Introduction**”, United States, No Starch Press, 2019.
5. Kanetkar Yashavant Kanetkar, Aditya, and Kanetkar, Aditya. “**Challenges in C++ Programming**”, India, BPB Publications, 2017.

WEB REFERENCES

1. <https://alison.com/course/introduction-to-c-plus-plus-programming>
2. <http://www.cplusplus.com>
3. <http://www.stroustrup.com/C++11FAQ.html>.
4. <https://www.learncpp.com/>
5. <https://www.geeksforgeeks.org/c-plus-plus/>

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

PO – CO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	H	M	M	M	M	L	H	H	M
CO2	M	M	M	M	M	L	H	H	M
CO3	H	H	H	M	M	L	H	H	M
CO4	H	H	H	H	H	L	H	H	H

PSO – CO MAPPING

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

(For Candidates admitted in the academic year 2023-2024)

Course Title	Core Course 4: C++ PROGRAMMING - LAB
Code	U23CA2CCP02
Course type	Practical
Semester	II
Hours/Week	5
Credits	5
Marks	100

CONSPECTUS

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

COURSE OBJECTIVES

1. To learn how to write inline functions for efficiency and performance.
2. To learn the syntax and semantics of the C++ programming language and design C++ classes for code reuse.
3. To learn how to implement copy constructors and class member functions.
4. To learn how to overload functions and operators in C++.
5. To learn how inheritance and virtual functions implement dynamic binding with polymorphism.

EXERCISES

1. Write a C++ program to demonstrate function overloading, Default Arguments and Inline function.
2. Write a C++ program to demonstrate Class and Objects.
3. Write a C++ program to demonstrate the concept of Passing Objects to Functions.
4. Write a C++ program to demonstrate the Friend Functions.
5. Write a C++ program to demonstrate the concept of Passing Objects to Functions.
6. Write a C++ program to demonstrate Constructor and Destructor.
7. Write a C++ program to demonstrate Unary Operator Overloading.
8. Write a C++ program to demonstrate Binary Operator Overloading.
9. Write a C++ program to demonstrate:
 - Single Inheritance
 - Multilevel Inheritance
 - Multiple Inheritance
 - Hierarchical Inheritance
 - Hybrid Inheritance
10. Write a C++ program to demonstrate Virtual Functions.
11. Write a C++ program to manipulate a Text File.
12. Write a C++ program to perform Sequential I/O Operations on a file.
13. Write a C++ program to find the Biggest Number using Command Line Arguments.
14. Write a C++ program to demonstrate Class Template.
15. Write a C++ program to demonstrate Function Template.
16. Write a C++ program to demonstrate Exception Handling.

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-K4)
CO-1	Remember the program structure of C++ with its syntax and semantics.	K1
CO-2	Able to understand and design the solution to a problem using object-oriented programming concepts.	K2
CO-3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism.	K3
CO-4	Analyze and implement the various methods of solving a problem and choose the best method of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.	K4

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

PO – CO MAPPING

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

PSO – CO MAPPING

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

(For Candidates admitted in the academic year 2023-2024)

Course Title	SEC 2 (NME 2): OPEN SOURCE TECHNOLOGIES
Code	U23CA2SET02
Course type	Theory
Semester	II
Hours/Week	2
Credits	2
Marks	100

CONSPECTUS

To learn the key concepts, tools, and processes to contribute to any open source project.

COURSE OBJECTIVES

1. To able to Acquire and understand the basic concepts in Linux.
2. To acquire knowledge about files system and Unix files
3. To identify the significance and application of apache, modifying the defaults and Analyzing securing
4. To understand about the MYSQL and database tables
5. To Create PHP with database access.

UNIT I

6hrs

AN INTRODUCTION TO OSS : Introduction - Need for Open Source Applications - History - Meaning and Extraction of the Terms Free Software and Open Source Software - Free Software Foundation and Open Source Initiative Presentation - Security and Reliability - Economical Aspects and Adoption - Applications of Open Source Software – Recapitulation.

Extra Reading/Keywords: Mozilla, embedded system.

UNIT II

6 Hrs

LINUX BASICS : Introduction - Kernel/User Mode – **Process:** Types of Processes - Types of Identifiers Related to a Process - Process States - Creation of Process

Extra Reading/Keywords: Hardware, design, open office.

UNIT III

6 Hrs

PHP BASICS : Introduction – Identifiers – Variables – Constants - Data Types – **Operators :** Arithmetic Operators - Assignment Operators - Bitwise Operators - Incrementing/Decrementing Operators - Comparison Operators - Logical Operators - String Operators - Array Operators - Operator Precedence and Associativity.

Extra Reading/Keywords: impact of open source, shared software

UNIT IV

6 Hrs

MYSQL DATABASE : Introduction – setting up an environment – starting terminating and writing your own sql programs – **record selection technology:** SELECT command – UPDATE command – DELETE command – data types- numeric types – string types – data and time data types

Extra Reading/Keywords: application projects, sources

UNIT V

6 Hrs

PHP Advanced: Introduction – basic syntax of python – **datatypes:** Numbers – string – tuples and sequences – lists – dictionaries.

Extra Reading/Keywords: PHP conditional statements, loops.

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-K4)
CO-1	The basic concepts in open source software and Linux	K1
CO-2	knowledge about Linux essential with commands	K2
CO-3	Understand about the MYSQL with database creation	K3
CO-4	Understand about the PHP and conditional statements	K4

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

TEXT BOOK

1. B. Mohamed Ibrahim “**Open Source Web Development with LAMP using LINUX, Apache, MySQL, Perl and PHP**”, Dorling Kindersley (India) Pvt. Ltd, 2008.

SUGGESTED READINGS

1. Eric Rose brock, Eric Filson, ”**Setting up LAMP: Getting Linux, Apache, MySQL and PHP and working together**”, John Wiley and Sons, 2004.
2. Anthony Butcher, “**Teach Yourself My SQL in 21 days**”, 2nd Edition, Sams Publication, 2002.
3. Rich Bower, Daniel Lopez Ridreejo, Alian Liska, “**Apache Administrator’s Handbook**”, Sams Publication, 2002.
4. Tammy Fox, “**Red Hat Enterprise Linux5 Administration Unleashed**”, Sams Publication
5. Naramore Eligabette, Gerner Jason, “**Beginning PHP5, Apache, MySQL Web Development**”, Wrox Press, Wiley Dreamtech Press, 2005.

WEB REFERENCES

1. <https://www.geeksforgeeks.org/introduction-to-open-source-and-its-benefits/>
2. <https://www.bing.com/>
3. <https://www.phoenixnap.com/kb/create-directory-linux-mkdir-command>
4. <https://www.phppot.com/php/command-line-php/>
5. <https://www.google.com/url://dev.mysql.com/doc/refman/8.0/en/getting-information>

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
CO1	H	M	M	M	M	L	H	H	M
CO2	M	M	M	M	M	L	H	H	M
CO3	H	H	H	M	M	L	H	H	M
CO4	H	H	H	H	H	L	H	H	H

PSO – CO MAPPING

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

(For Candidates admitted 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)
UG COURSE PATTERN
BCA

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 SkillBased 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

LIST OF ALLIED PAPERS OFFERED BY THE DEPARTMENT TO OTHER DEPARTMENTS

Semester	Part	Course and Department	Title of the Course	Code	Hours/Week	Credits	Marks
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

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

Non Major Elective Courses offered by the department:

Semester	Par	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

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

Semester	Part	Course	Title of the course	Code	Hours/Week	Credits	Marks	
IV	I	Language	Tamil Paper IV/ Hindi Paper IV/ French Paper IV	U22TL4GEN04/ U22HN4HIN04/ 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 Major Elective –2	Non Major Elective – 2	-	2	2	100	
		Value Education	Ethics II / Bible Studies II/ Catechism II	U22VE4LVE02/ U22VE4LVB02/ 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

LIST OF ALLIED PAPERS OFFERED BY THE DEPARTMENT TO OTHER DEPARTMENTS

Semester	Part	Course and Department	Title of the Course	Code	Hours/Week	Credits	Marks
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
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

Non Major Elective Courses offered by the department:

Semester	Part	Course	Title of the Course	Code	Hrs/Wk	Credits	Marks
IV	IV	Non Major Elective – 2	Basic Drawing and Editing-Lab	U22CA4NMP02	2	2	100

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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)

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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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)

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

Course Title	Major Elective -1 - Modern 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)

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 Madiseti, “**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

(For Candidates admitted in the academic year 2022-2023)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – Second Year - Semester – III

Course Title	Major Elective - 1 : 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)

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 Mautua, “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

(For Candidates admitted in the academic year 2022-2023)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – Second Year - Semester – III

Course Title	Major Skill Based Elective (MSBE)-1Web 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, creating Functions.
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)

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

(For Candidates admitted in the academic year 2022-2023)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 620 002
SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
BCA – Second Year - Semester – III

Course Title	Non Major Elective -1- 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)

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 Practical Guide**”, 2003, Charles River Media.
2. Winn L. Rosch, “**The Winn L. Rosch Hardware Bible**”, 2003, A Prentice Hall Computer, 6th Edition.
3. Kate J. Chase, “**PC Hardware and A+ Handbook**”, 2004, Microsoft Corporation.
4. Anfinson David, Quamme Ken, “**IT Essentials – PC Hardware and Software Companion Guide**”, 2008, Cisco Press, Pearson India.
5. Ron Gilster, “**PC Hardware: A Beginner’s Guide**”, 2001, Tata McGraw – Hill Publishing Company, New Delhi.

WEB REFERENCES

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

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

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

(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
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)

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 Data 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)

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	III
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 demonstratethetypes in Thread creation and Exception Handling
5. To Create the Applet Programming and applythe 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 of object-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 custom checked 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 - Introduction to Database Management System.

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

UNIT II

12 Hrs

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

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

UNIT III

12 Hrs

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

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

UNIT IV

12 Hrs

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

Extra Reading/ Keywords: *Hactivism, 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 apply the suitable solution for them.	K5

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

TEXT BOOKS

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

SUGGESTED READINGS

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

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

WEB 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 interact 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 the techniques 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 of an object
6. Easy text offsets
7. Cutting outline in the text
8. Turn an Image into a Vector
9. Convert Photograph to SVG
10. To Crop An Image and Remove Background

COURSE OUTCOMES

The Learner will be able to:

CO No.	Course Outcomes	Cognitive Level (K1-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, 5NF.*

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 files in C

UNIT I

12 Hrs

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

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

UNIT II

12 Hrs

CONSTANTS, VARIABLES, AND DATA TYPES: Introduction – Character Set – C Tokens– Keywords and Identifiers – Constants – Variables – Data Types – Declaration of Storage Class.
OPERATORS AND EXPRESSIONS: Introduction - Arithmetic Operators - Relational Operators- Logical Operators - Assignment Operators - Increment and Decrement Operators- Conditional Operators- Bitwise Operators - Special Operators - Arithmetic Expressions - Evaluation of Expressions - Precedence of Arithmetic Operators
- Some Computational Problems.

Extra Reading/Keywords: Operators in python.

UNIT III**12 Hrs****MANAGING INPUT AND OUTPUT OPERATORS:** Introduction - Formatted Input - Formatted Output.**DECISION MAKING AND BRANCHING:** Introduction - Decision Making with if Statement - Simple if Statement- The if else Statement - Nesting of if...else Statements - The Else if Ladder - Switch Statement - ?: Operator – Goto Statement.*Extra Reading/Keywords: Develop programs using decision making and branching statement.***UNIT IV****12 Hrs****DECISION MAKING AND LOOPING:** Introduction – The While Statement - The 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 the concepts of Constants, Variables, Keywords and Data types;	K2
CO-3	Compare the various forms of If statements, Looping statement, Arrays and Functions.	K3
CO-4	Analyze the various constructs and use appropriate statement to solve the problem using C effectively	K4
CO-5	Evaluate the performance of the C Program for the given scenario using the various constructs of C Language.	K5

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

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

COURSE OBJECTIVES

1. To understand the use of constants, variables, data types, operators, syntax of different statements, strings, user defined functions, structures, union, pointers and files in developing C program
2. To apply the basic concepts in developing C Programming
3. To analyze different forms of decision making with if statements to develop C programs effectively
4. To evaluate the different types of looping constructs and arrays to solve problems
5. 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 in an array.
7. To perform matrix multiplication.
8. To generate the Fibonacci series.
9. To prepare mark sheet using looping statement.
10. To prepare payroll using looping statement.

COURSE OUTCOMES

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 program using the operators, arrays.	K2
CO-3	Apply the basic concepts to develop C Programs	K3
CO-4	Analyse the different forms of decision-making using C Programs	K4
CO-5	Evaluate the different types of looping constructs using C programs	K5

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

PO-CO MAPPING

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

PSO-CO MAPPING

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

(For Candidates admitted 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. Write a 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

(For Candidates admitted in the academic year 2021-2022)
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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
UG COURSE PATTERN
BCA

Semester	Part	Course	Title of the course	Code	Hours/ Week	Credits	Marks
V	III	Major Core –11	Software Engineering Concepts	U21CA5MCT11	4	4	100
		Major Core –12	Cloud Computing	U21CA5MCT12	4	4	100
		Major Core –13	Computer Networks	U21CA5MCT13	4	4	100
		Major Core –14	Object-Oriented Programming Using C# and .Net	U21CA5MCT14	4	4	100
		Major Core–15	Object-Oriented Programming Using C# and .Net – Lab	U21CA5MCP15	4	3	100
		Major Elective–3	Fundamentals of Data Science/ Digital Marketing	U21CA5MET05/ U21CA5MET06	4	3	100
	IV	Non Major Elective - 3	Non Major Elective - 3	-	3	3	100
		Major Skill Based Elective–2	Multimedia – Lab	U21CA5SBP02	2	1	100
		Value Education	Ethics III / Bible Studies III/ Catechism III	-	1	-	-
	VI	Online Course		U21OC5ECT01	-	2 (EC)	100
		Internship / Field Work / Field Project 30 Hours - Extra Credit		U21SP5ECC05	-	2 (EC)	100
		TOTAL			30	26+2+2	800+ 100+ 100

LIST OF MAJOR ELECTIVE COURSES OFFERED BY THE DEPARTMENT:

Semester	Part	Course	Title of the Course	Code	Hrs / Wk	Credits	Marks
V	III	Major Elective – 3	Introduction to Python Programming (III B.Com CA)	U21CA5MEP04	4	3	100

LIST OF NON MAJOR ELECTIVE COURSES OFFERED BY OUR DEPARTMENT:

Semester	Part	Course	Title of the Course	Code	Hrs / Wk	Credits	Marks
V	IV	Non Major Elective - 3	Introduction to Smart Technologies	U21CA5NMT03	3	3	100

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

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

LIST OF MAJOR ELECTIVE COURSES OFFERED BY THE DEPARTMENT:

Semester	Part	Course	Title of the Course	Code	Hrs/ Wk	Credits	Mark
VI	IV	Major Elective -4	Relational Database Management Systems-Lab (III B.Com CA)	U21CA6MEP09	4	3	100

LIST OF NON MAJOR ELECTIVE COURSES OFFERED BY OUR DEPARTMENT:

Semester	Part	Course	Title of the Course	Code	Hrs/ Wk	Credits	Marks
VI	IV	Non Major Elective- 4	Futuristic Technologies in IT	U21CA6NMT04	3	3	100

(For Candidates admitted in the academic year 2021-2022)
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CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
B.C.A. - Third Year - Semester – V

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

CONSPECTUS

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

COURSE OBJECTIVES

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

UNIT I

12 Hrs

INTRODUCTION: Evolution: From an art form to Engineering Discipline – Software Development Projects – Exploratory Style of Software Development -Emergence of Software Engineering – Changes in Software Development Practices – Computer Systems Engineering.
SOFTWARE LIFE CYCLE MODELS: Basic Concepts - Waterfall Model and its Extensions- RAD Model-Spiral Model.

Extra Reading /Key words: Additional Process Models.

UNIT II

12 Hrs

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

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

Extra Reading /Key words: Other design techniques.

UNIT III

12 Hrs

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

FUNCTION-ORIENTED SOFTWARE DESIGN : Overview of SA/SD Methodology –

Structured Analysis – Developing the DFD model as a System – Structured Design - Detailed Design – Design Overview

Extra Reading /Key words: Other architectural designs.

UNIT IV**12 Hrs**

CODING AND TESTING: Coding – Code Review – software documentation-Testing – Unit Testing – Black-Box Testing – White-Box Testing – Debugging – Program Analysis Tools – Integration Testing – System Testing.

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

UNIT V**12 Hrs**

SOFTWARE RELIABILITY AND QUALITY MANAGEMENT: Software Reliability– Software Quality – Software Quality Management System – ISO 9000 – SEI Capability Maturity Model.

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

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

Course Outcomes:**The Learners**

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

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

TEXT BOOK

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

Unit I: Chapter 1: (1.1-1.6), Chapter 2: (2.1-2.3,2.5)

Unit II: Chapter 3(3.1-3.7), Chapter 4: (4.1-4.3)

Unit III: Chapter 5(5.1-5.5), Chapter 6(6.1-6.6)

Unit IV: Chapter 10 (10.1-10.10,10.12)

Unit V: Chapter 11(11.1,11.3-11.6), chapter 13(13.1-13.4)

SUGGESTED READINGS

1. Roger S. Pressman, “**Software Engineering – A Practitioner’s Approach**”, 8/e”, McGraw Hill International, 8th Ed., 2019.
2. Ian Sommerville, “**Software Engineering**”, Addison Wesley, 10th ed., Singapore, 2015.
3. K.K. Agarwal & Yogesh Singh, “**Software Engineering**”, New Age Intl. Publishers, Revised Ed., 2007.
4. Roger S. Pressman, “**Software Engineering – A Practitioner’s Approach**”, McGraw Hill International, 9th Ed., 2008.
5. Shari Lawrence Fleeger, “**Software Engineering: Theory and Practice**”, Pearson Education Asia, New Delhi, 2007.

PO–CO MAPPING

CO/PO	PO1	PO2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9
CO-1	M	M	H	H	H	L	M	M	M
CO-2	H	H	H	H	H	M	H	H	H
CO-3	H	H	H	H	H	M	H	H	H
CO-4	H	H	H	H	H	H	H	H	H
CO-5	H	H	H	H	H	H	H	H	H

PSO–CO MAPPING

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

(For Candidates admitted in the academic year 2021-22)
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CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
Third Year - Semester – V

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

CONSPECTUS

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

COURSE OBJECTIVES:

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

UNIT I : FUNDAMENTAL CLOUD COMPUTING

12Hrs

UNDERSTANDING CLOUD COMPUTING: Origins And Influences - Basic Concepts And Terminology

- Goals And Benefits. **FUNDAMENTAL CONCEPTS AND MODELS:** Roles And Boundaries – Cloud Characteristics - Cloud Delivery Models - Cloud Deployment Models.

Extra Reading /Key words: *Cloud Enabling Technology.*

UNIT II : CLOUD COMPUTING MECHANISMS

12Hrs

CLOUD INFRASTRUCTURE MECHANISMS: Logical Network Perimeter – Virtual Server – Cloud Storage Device – Cloud Usage Monitor. **SPECIALIZED CLOUD MECHANISMS:** Automated Scaling Listener – Load Balancer – SLA Monitor – Pay-Per Use Monitor – Audit Monitor – Failover System.

Extra Reading /Key words: *Multi Device Broker*

UNIT III : CLOUD SECURITY

12Hrs

FUNDAMENTAL CLOUD SECURITY: Basic Terms and Concepts-Threat Agents - Cloud Security Threats.

CLOUD SECURITY MECHANISMS: Encryption -Hashing- Digital Signature – Public Key Infrastructure- Identity and Access Management – Single Sign On – Cloud Based Security Groups – Hardened Virtual Server Images.

Extra Reading /Key words: *Security Policy Disparity.*

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

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

Extra Reading /Key words: *Cloud virtualization*

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

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

CASE STUDY BACKGROUND : ATN – DTGOV – Innovartus Technologies Inc

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

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

COURSE OUTCOMES

The Learner will be able to:

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

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

TEXT BOOK

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

UNIT I : Chapters 3 (3.1 – 3.3) ,4

UNIT II : Chapters 7 (7.1 – 7.4) & 8 (8.1 – 8.6)

UNIT III : Chapters 6 (6.1-6.3) & 10

UNIT IV : Chapters 11(11.1-11.7) & 12 (12.1, 12.2, 12.5)

UNIT V : Chapters 14, 2

SUGGESTED READINGS

- 1.Mehul Mahrishi Kamal Kant Hiran, Ruchi Doshi, Dr. Fagbola Temitayo, “**Cloud Computing**”, BPB Publications, First Edition, 2019.
- 2.Sanjiva Shankar Dubey, “**Cloud Computing and Beyond : A Managerial Perspective**”, Wiley Publications, 2019.
- 3.Dr. Kumar Saurabh, “**Cloud Computing – Architecturing Next-Gen Transformations Paradigm**”,Fourth Edition, Wiley Publications, 2017.
- 4.Prasanta Pattnaik, Manas Kabat, “**Fundamentals of Cloud Computing**”, S.Chand (G/L)& Company Ltd, First Edition (2014).
- 5.Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Dr. Deven Shah, “**Cloud Computing –Black Book**”, Dream Tech Publications, 2014

PO–CO MAPPING

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

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)
B.C.A. - Third Year - Semester – V

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

CONSPECTUS

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

COURSE OBJECTIVES

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

UNIT I : OVERVIEW

12 Hrs

Data Communications –Networks - Protocol and Standards. *Network Models*: Layered tasks- OSI Model-TCP/IP Protocol Suite-Addressing.

Extra Reading/Keywords : *IoT interoperation across the OSI model.*

UNIT II : PHYSICAL LAYER AND MEDIA

12 Hrs

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

Extra Reading/Keywords: *Mobile Telephone System.*

UNIT III : NETWORK LAYER

12 Hrs

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

Extra Reading/Keywords: *Internet Routing Protocols*

UNIT IV : TRANSPORT LAYER**12 Hrs**

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

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

UNIT V : APPLICATION LAYER**12 Hrs**

Domain Name System: Name space - Domain Name Space -Electronic Mail - File Transfer.

Cryptography: Introduction - Symmetric key cryptography –Asymmetric key cryptography.

Extra Reading/Keywords: *Communication Security and Web Security*

COURSE OUTCOMES:**The Learner**

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

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

TEXT BOOK

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

SUGGESTED READINGS

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

PO – CO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS:

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

COURSE OBJECTIVES

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

UNIT I:

12 Hrs

Overview of .NET Framework: .NET Framework Architecture - .NET Features – The Common Language Runtime – The .NET Framework Class Library – The Common Type System – Visual Studio .NET IDE 2005 – Windows Programming Fundamentals.

Windows Controls – Category 1: Control Class – Text Boxes – Rich Text Boxes – Labels - Link Labels – Buttons.

Extra Reading/ Keywords: Microsoft Visual Studio Environment

UNIT II:

12 Hrs

Windows Controls – Category 2: Check Boxes – Radio Buttons – Panels – Group Boxes – List Boxes – Checked List Boxes – Combo Boxes.

Extra Reading/ Keywords: Win GUI Controls used with multiple applications

UNIT III:

12 Hrs

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

Extra Reading/ Keywords: GUI applications with Windows control categories

UNIT IV:

12 Hrs

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

Extra Reading/ Keywords: Multiple Integrated Web page applications

UNIT V:**12 Hrs****Data Access with ADO.NET:** ADO.NET Architecture – Advantages – ADO.NET Objects.**Handling Databases in Code:** Connection Class – Command Class – DataAdapter – The DataSet Class – Data Reader Class – DataTable Class – DataRow Class – DataColumn Class – DataRelation Class**Extra Reading/ Keywords:** Case Studies with Front and Back ends in Microsoft Visual Studio setting**Course Outcomes:****The Learners**

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

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

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

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

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

CO - PO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVES

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

EXERCISES IN C#:

Console Applications

1. Simple Computations
2. Mark sheet Preparation
3. Telephone Bill Generation
4. Payroll Creation
5. Super Market Bill Preparation

Windows Applications

1. Simple Calculator and Scientific Calculator
2. Student ID Card Registration
3. Timer Creation
4. Notepad Application
5. Creating Library Database

COURSE OUTCOMES

The Learner

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

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

PO – CO Mapping

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

PSO – CO Mapping

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

(For Candidates admitted in the academic year 2021-2022)
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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
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CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
B.C.A. - Third Year - Semester – V

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

CONSPECTUS

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

COURSE OBJECTIVES

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

UNIT I:

12 Hrs

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

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

UNIT II:

12 Hrs

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

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

UNIT III:

12 Hrs

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

Extra Reading/Keywords: *Exploration, Synthesis.*

UNIT IV:

12 Hrs

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

Extra Reading/Keywords: *Exploration, Synthesis.*

UNIT V:**12 Hrs**

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

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

Course Outcomes:

The Learners will be able to

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

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

TEXT BOOKS

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

SUGGESTED READINGS

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

CO - PO MAPPING

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

PSO – CO MAPPING

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

(For Candidates admitted in the academic year 2021-2022)
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SCHOOL OF MATHEMATICAL COMPUTATION SCIENCES
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CHOICE BASED CREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
B.C.A. - Third Year - Semester – V

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

CONSPECTUS

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

COURSE OBJECTIVES

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

UNIT-I INTRODUCTION AND SEO 12 HRS

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

Extra Reading/Keywords: *Online Marketing*

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

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

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

UNIT-III EMAIL MARKETING AND MOBILE MARKETING 12 HRS

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

Extra Reading/Keywords: *Marketing Mix*

UNIT-IV SOCIAL MEDIA MARKETING 12 HRS

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

Extra Reading/Keywords: *Network Marketing*

UNIT-V STRATEGY AND PLANNING 12 HRS

Introduction – Approach - Audience – Activities - Analysis.

Extra Reading/Keywords: *B2B, Marketing*

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

COURSE OUTCOMES

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

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

TEXT BOOKS

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

Unit I: Chapter-1, 2

Unit II: Chapter-3, 4

Unit III: Chapter-5, 8

Unit IV: Chapters 6, 7

Unit V: Chapters 10

SUGGESTED READINGS

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

WEB REFERENCES

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

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

CO - PO MAPPING

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

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 in the academic year 2021-2022)
HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-620002
SCHOOL OF MATHEMATICAL COMPUTATIONSCIENCES
PG DEPARTMENT OF COMPUTER APPLICATIONS
CHOICE BASEDCREDIT SYSTEM
LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
B.Com.CA - Third Year - Semester – V

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

CONSPECTUS

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

COURSE OBJECTIVES

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

UNIT I

12 Hrs

The Python REPL: Introduction - Features of Python - Python as a Calculator – Variables – String Operations - Print Statements. Data Types and Variables: Introduction - Numeric Data Types - Boolean Data Type – Strings – Lists - Dictionaries and Tuples. Matrices and Arrays: Introduction - Installing NumPy – NumPy - Array Creation - ARRAY INDEXING - Array Slicing - Array Operations.

Extra Reading/Keywords : *Python Set types, Python Packages.*

UNIT II

12 Hrs

Functions and Modules: Introduction - Defining Functions in Python - Functions with Multiple Arguments - Functions with Default Arguments - Calling Functions from Other Files - Docstrings in Functions - Positional and Keyword Arguments Control Structures: If Else Try Except – Introduction - User Input - If statements - Selection Statements - If Else Statements - Try-Except Statements – Flowcharts. Loops: Introduction – For Loops - While Loops - Break and Continue - Flowcharts Describing Loops.

Extra Reading/Keywords : *Boolean Operators.*

UNIT III

12 Hrs

Exercise programs: Input and Output operations - Operators - Arrays - Strings - Functions.

Extra Reading/Keywords: *System of Linear Equations.*

UNIT IV

12 Hrs

Exercise programs: Control structures & loops - Lists - Dictionaries and Tuples

Extra Reading/Keywords: *Boolean Operators.*

UNIT V

12 Hrs

Exercise programs: Data visualization with different Charts.

Extra Reading/Keywords : *3D Surface Plots.*

List of Exercises

1. Input and Output operations

Write a python program to add two numbers using Input and Output Functions

2. Operators

Write a program to create a menu with the following options

1. To Perform Addition
2. To Perform Subtraction
3. To Perform Multiplication
4. To Perform Division

3. Functions and Modules

Accepts users input and perform the operation accordingly. Use functions with arguments.

To check whether the given string is palindrome or not
To find factorial of a given number using functions

To double a given number and add two numbers using lambda()

To display a particular month of a year using calendar module.

To print all the months of given year

To print date, time for today and now

To print date, time using date and time functions

Python program which accepts the radius of a circle from user and computes the area (use math module).

Python function that takes two lists and returns True if they are equal otherwise false

4. Lists

Create a list and perform the following methods

- 1) insert()
- 2) remove()
- 3) append()
- 4) len()
- 5) pop()
- 6) clear()

5. Dictionaries

Create a dictionary and apply the following methods

- 1) Print the dictionary items
- 2) access items
- 3) use get()
- 4) change values
- 5) use len()

6. Tuples

Create a tuple and perform the following methods

- 1) Add items
- 2) len()
- 3) check for item in tuple
- 4) Access items

7. Control structures & loops:

To print a number is positive/negative using if-else

To find largest number among three numbers

To read a number and display corresponding day using if_elif_else

To calculate discount based on input amount

8. Arrays

Using a numpy module create an array and check the following:

1. Type of array
 2. Axes of array
 3. Shape of array
 4. Type of elements in array
- To concatenate the data frames with two different objects

To read a csv file using pandas module and print the first and last five lines of a file.

9. Data visualization with different Charts

Visualization using Matplotlib

To set background color and pic and draw a square and fill the color using turtle module

Course Outcomes:

The Learners

CO No.	Course Outcomes	Cognitive Level (K1-K5)
CO-1	Interpret the basic principles of Python programming language; to create and manipulate lists, tuples and Dictionaries	K1
CO-2	Implement programs using functions and strings.	K2
CO-3	Develop Python programs with conditionals and loops.	K3
CO-4	Illustrate and analyze the data visualization with different Charts	K4
CO-5	Illustrate and interpret the concepts of arrays and matrices to manipulate and perform mathematical operations	K5

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

TEXT BOOK

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

SUGGESTED READINGS

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

CO-PO MAPPING

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

PSO-CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVES

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

UNIT I

9Hrs

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

Extra Reading/Keywords :Smart Technologies

UNIT II

9Hrs

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

Extra Reading/Keywords : Data Analysis

UNIT III

9Hrs

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

Extra Reading/Keywords : Smart Boards

UNIT IV**9Hrs**

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

Extra Reading/Keywords : Automation of Industries

UNIT V**9Hrs**

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

Extra Reading/Keywords :Smart City

COURSE OUTCOMES:

The Learner will be able to :

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

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

TEXT BOOK

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

SUGGESTED READINGS

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

PO – CO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVES

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

EXCERCISES:

1. Creation of 3D Text effect with GIMP.
2. Placing an image inside text.
3. Reflection effect underneath a text.
4. Changing a color photo to pencil drawing.
5. Rainbow Effect.
6. Rain Effect.
7. Sunshine Effect.
8. Text Portrait Effect.
9. Displaying photos on a cube.
10. Sliced Text Effect.

COURSE OUTCOMES

The Learner will be able to:

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

(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	M	M	H	H	H	H	H
CO-2	M	M	M	M	H	H	H	H	H
CO-3	H	H	H	M	H	H	H	H	H
CO-4	H	H	H	H	M	H	H	H	H
CO-5	H	H	H	M	H	H	H	H	H

PSO – CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVES

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

UNIT I

12 Hrs

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

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

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

UNITII

12Hrs

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

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

UNIT III

12 Hrs

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

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

UNIT IV

12 Hrs

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

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

UNIT V**12 Hrs****FILE-SYSTEMINTERFACE:** File Concept–Access Methods–Directory Structure–File System Mounting– File Sharing–Protection. **FILE-SYSTEM****IMPLEMENTATION:** File-System Structure – File System Implementation- Directory Implementation–Allocation Methods.**Extra Reading/Keywords:** *Comparing the allocation methods, free open OS software***COURSE OUTCOMES****The Learner will be able to:**

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

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

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

SUGGESTED READINGS

- 1 William Stallings, “**Operating Systems**”, Pearson Education Publications, Singapore, Ninth edition, 2019.
- 2 G. Sreehitaha reddy, “**Operating Systems Concepts**”, Notion press, 2019.
- 3 Dr. Priyanka rathee, “**Basic Principles of an Operating System**”,BPB publications, 2019.
- 4 Pramod bhatt, “**An introduction to Operating System**”, Fifth edition, PHI private Ltd., 2019.
- 5 Charles Crowley, “**Operating system : A design- Oriented approach**”, McGraw Hill Education, 2017.

WEB REFERENCES

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

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

CO - PO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS:

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

COURSE OBJECTIVES:

1. To demonstrate the working principle of various video display devices such as CRT, LCD and LED systems and categorize the input and output devices used in graphics systems.
2. To examine the specification of basic geometric structures such as Points, Lines, Circles & curves.
3. To apply the various attributes that control the appearance of the displayed Primitives.
4. To apply two dimensional transformations and clipping techniques in 2D scenes.
5. To recognize the three dimensional display methods and compare parallel and perspective projections.

UNIT I

12 Hrs

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

Extra Reading/Keywords: *CRT, LCD, LED.*

UNIT II

12 Hrs

OUTPUT PRIMITIVES: Points and Lines - Line-Drawing Algorithms: DDA Algorithm- Bresenham's Line Algorithm - Loading the Frame Buffer - Line Function - Circle-Generating Algorithms: Properties of Circles - Midpoint Circle Algorithm - Curve Functions – Fill-Area Functions – Character Generation.

Extra Reading/Keywords: *Ellipse Algorithm, Spline Curves.*

UNIT III

12 Hrs

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

Extra Reading/Keywords: *Color table, Fill Styles.*

UNIT IV**12 Hrs****TWO - DIMENSIONAL GEOMETRIC TRANSFORMATIONS:** Basic Transformations:

Translation – Rotation – Scaling– Matrix Representations and Homogeneous Coordinates - Composite Transformations: Translations – Rotations -- Scaling. Other Transformations: Reflection -- Shear - Transformations between Coordinate systems - Affine Transformations - Transformation functions - Raster Methods for transformations.

TWO – DIMENSIONAL VIEWING: Window to View port Coordinate Transformations - Clipping Operations - Point Clipping - Line Clipping: Cohen Sutherland Line Clipping – Polygon Clipping: Sutherland-Hodgeman Polygon Clipping.**Extra Reading/Keywords:** *Shear, Window, Viewport.***UNIT V****12 Hrs****THREE DIMENSIONAL CONCEPTS:** Three - Dimensional Display Methods: Parallel projection -- Perspective Projection -- Depth Cueing -- Visible Line and Surface – Identification -- Surface Rendering -- Exploded and Cutaway Views -- Three-dimensional and Stereoscopic views - - Three-Dimensional Graphics Packages.**THREE – DIMENSIONAL VIEWING:** Viewing Coordinates: Specifying the View Plane-- Transformation from World to Viewing Coordinates -- Projections: Parallel projection -- Perspective Projection.**Extra Reading/Keywords:** *Depth Cue, Convergence.***COURSE OUTCOMES****The Learner will be able to:**

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

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

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

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

SUGGESTED READINGS

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

WEB REFERENCES

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

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

PO – CO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVES

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

UNIT I

12 Hrs

INTRODUCTION TO IOT: Introduction and Definition of Internet of Things – IoT growth – A Statistical View – Application Areas of IoT – Characteristics of IoT – Things in IoT – IoT Stack – Enabling Technologies – IoT Challenges – IoT Levels – Cyber Physical System versus IoT – Wireless Sensor Network versus IoT.

Extra Reading/Keywords: *Bio sensors, Nano sensors*

UNIT II

12 Hrs

INTRODUCTION TO SENSORS, MICROCONTROLLERS AND THEIR INTERFACING:

Introduction to Sensor Interfacing –Types of Sensors: MQ-02/05 – Gas Sensor Interfacing with Node MCU / Arduino – Interfacing the Obstacle Sensor - Interfacing the Heartbeat Sensor - Interfacing the Ultrasonic Sound Sensor - Interfacing the Gyro Sensor - Interfacing the LDR Sensor - Interfacing the GPS – Interfacing the Colour Sensor - Interfacing the pH Sensor - Controlling Sensors through Webpages – Microcontrollers: A Quick Walkthrough – Advanced RISC Machine.

Extra Reading/Keywords: *5G technology, Ambient intelligence*

UNIT III

12 Hrs

PROTOCOLS FOR IOT& CLOUD FOR IOT: PROTOCOLS FOR IOT - MESSAGING AND TRANSPORT: Introduction – Messaging Protocols – XMPP and DDS s – Transport Protocols.

PROTOCOLS FOR IOT - ADDRESSING AND IDENTIFICATION: Introduction – Internet Protocol Version 4 (IPv4) - Internet Protocol ion 6 (IPv6) – IPv6: A Quick Overview – Internet Protocol Version 5 (IPv5) – Uniform Resource Identifier (URI). **CLOUD FOR IOT:** Introduction– IoT with Cloud – Challenges – Selection of Cloud Service Provider: An Overview – Introduction to Fog Computing – Cloud Computing: Security Aspects.

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

UNIT IV

12 Hrs

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

Extra Reading/Keywords: *Physical Web, DNS*

UNIT V

12 Hrs

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

Extra Reading/Keywords: *Simulator-Proteus*

COURSE OUTCOMES

The Learner will be able to:

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

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

TEXT BOOKS

- Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, “**Internet of Things**”, Wiley India Pvt. Ltd., 2020.
UNIT I: Chapter 1
UNIT II: Chapter 2
UNIT III: Chapters 3, 4, 5.
- Olivier Hersent, David Boswarthick, Omar Elloumi, “**The Internet of Things – Key applications and Protocols**”, Wiley India Pvt. Ltd., 2018.
UNIT IV: Chapters 3,5,7 (7.1 – 7.8)
- Michael Miller, “**The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities are changing the World**”, Pearson Education Services Pvt. Ltd., 2019.
UNIT V: Chapters 5, 6.

SUGGESTED READINGS

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

WEB REFERENCES

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

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

PO – CO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVES

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

UNIT I

12 Hrs

INTRODUCTION TO BIG DATA AND ANALYTICS : Classification of Digital Data, Structured and Unstructured Data - Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data -Why Big Data - Data Warehouse and Hadoop Environment Big Data Analytics: Classification of Analytics – Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments - Basically Available Soft State Eventual Consistency - Top Analytics Tools.

Extra Reading/Keywords: *Big data & Importance, examples of Real and non-real time requirements*

UNIT II

12 Hrs

INTRODUCTION TO TECHNOLOGY LANDSCAPE : NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem.

Extra Reading/Keywords: *Importance of Distributed system in Big Data and its components.*

UNIT III

12 Hrs

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

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

UNIT IV

12 Hrs

INTRODUCTION TO HIVE AND PIG : Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements –Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having. Pig: Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types.

Extra Reading/Keywords: *Analyzing the examples of Big Data Operational Databases with Apps.*

UNIT V

12 Hrs

INTRODUCTION TO DATA ANALYTICS WITH R : Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Machine Learning Algorithms: Regression Model, Clustering, Collaborative Filtering, Association Rule Making, Decision Tree.

Extra Reading/Keywords: *Future enhancements of Big Data Analytics*

COURSE OUTCOMES

The Learner will be able to:

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

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

TEXT BOOK

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

SUGGESTED READINGS

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

WEB REFERENCES

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

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

CO - PO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVES

1. To understand the basics of Cyber Security.
2. To identify the domain of cyber security policy.
3. To analyze cyber security frameworks and security policy.
4. To apply security principles and develop control system.
5. To apply cyber security protection methods in real time applications.

UNIT I

12 Hrs

INFORMATION SECURITY OVERVIEW: The Evolution of Information Security-To build a Security Program: Authority-Framework-Assessment-Planning-Action-Maintenance-Business Processes Vs Technical Controls.

RISK ANALYSIS: Threat Definition: Threat Vectors-Threat Sources and Targets-Types of Attacks: Malicious mobile code-APTs-Manual Attacks-Risk Analysis.

Extra Reading/Keywords: *Compliance with standards (NIST, ISO27002, COBIT)*

UNIT II

12 Hrs

AUTHENTICATION AND AUTHORIZATION: Authentication: Usernames and Passwords-Certificate –Based Authentication-EAP-Biometrics-Additional uses for Authentication. Authorization: User Rights- Role Based Authorization (RBAC)-Access Control Lists (ACLs)-Rule-Based Authorization.

ENCRYPTION: Symmetric Key Cryptography-Public Key Cryptography.

DATABASE SECURITY: Understanding Database Security Layers: Server-Level Security-Network- Level Security-Operating System Security. Understanding Database Level Security : Database Administration Security-Database Roles and Permissions.

Extra Reading/Keywords: *Database backups and recovery*

UNIT III

12 Hrs

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

DISASTER RECOVERY, BUSINESS CONTINUITY, BACKUPS AND HIGH AVAILABILITY: Disaster Recovery-Business Continuity Planning-Backups.

Extra Reading/Keywords: *Security Information and Event Management (SIEM)*

UNIT IV

12 Hrs

INTRODUCTION TO CYBERCRIME: Definition-Classification of Cybercrimes :E-Mail Spoofing- Spamming- Cyber defamation-Internet Time Theft-Salami Attack/Salami Techniques-Data Diddling-Web Jacking-Pornographic Offenses-E-Mail Bombing-Password Sniffing-Credit Card Frauds-Identity Theft.

CYBEROFFENSES: Introduction-Categories of Cybercrime-Criminals Plan the Attacks-Reconnaissance-Passive Attacks-Active Attacks-Scanning and Scrutinizing Gathered Information-Attack. Cyber stalking: Types of Stalkers.

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

Extra Reading/Keywords: *Cyber Crime: Legal and Indian Perspectives, Cyber Crime and Indian ITA2000*

UNIT V

12 Hrs

CYBERCRIME: MOBILE AND WIRELESS DEVICES: Introduction-Trends in Mobility- Attacks on Mobile Phones-Laptops.

UNDERSTANDING COMPUTER FORENSICS : The need for Computer Forensics-Digital Forensics Life Cycle-Network Forensics.

CYBER SECURITY: ORGANIZATIONAL IMPLICATIONS : Introduction-Cost of Cybercrimes and IPR Issues. Security and Privacy Implications.

Extra Reading/Keywords: *Securing mobile devices, Disaster Recovery, Business Continuity, Backups and High Availability*

COURSE OUTCOMES

The Learner will be able to:

CO No.	COURSE OUTCOMES	Cognitive Level (K1-K5)
CO-1	Recall the basics of cyber security, cyber crimes and security tools to protect the data and software Identify various Analysis threats and antagonism in cyberspace	K1
CO-2	Differentiate various cyber security issues and Evidence Recovery tools	K2
CO-3	Apply suitable cyber law for each cybercrime and suitable security methods to cybercrimes	K3
CO-4	Analyze various Conflict management styles in Cyberspace	K4
CO-5	Evaluate Digital Emotional Intelligence (DEQ)	K5

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

TEXT BOOKS

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

SUGGESTED READINGS

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2021, 7th edition.
2. Micki Krause, Harold F. Tipton, “Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2017.
3. Stuart McClure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw- Hill, 2003 Matt Bishop, — Computer Security Art and Science, Pearson/PHI, 2022

WEB REFERENCES

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

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

CO - PO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVES

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

EXCERCISES

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

COURSE OUTCOMES

The Learner will be able to:

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

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

PO – CO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVES

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

EXCERCISES

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

COURSE OUTCOMES

The Learner will be able to:

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

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

PO – CO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVES

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

EXERCISES

SQL

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

COURSE OUTCOMES

The Learner will be able to:

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

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

PO – CO MAPPING

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

PSO – CO MAPPING

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

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

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

CONSPECTUS

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

COURSE OBJECTIVE

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

UNIT I

9 Hrs

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

Extra Reading /Keywords: *Mobile Edge Computing.*

UNIT II

9 Hrs

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

Extra Reading /Keywords: *Importance of Big Data*

UNIT III

9 Hrs

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

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

UNIT IV**9 Hrs**

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

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

UNIT V**9 Hrs**

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

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

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

COURSE OUTCOMES

The Learner will be able to:

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

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

TEXT BOOKS

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

SUGGESTED READINGS

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

WEB REFERENCES

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

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

PO – CO MAPPING

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

PSO – CO MAPPING

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